RIVERBANK SOURCE CONTROL MEASURE COMPLETION REPORT

EVRAZ Oregon Steel

Prepared for
EVRAZ Oregon Steel
14400 North Rivergate Blvd.
Portland, OR 97203

Prepared by

319 SW Washington Street
Suite 1150
Portland, OR 97204

108 S Washington Street
Suite 300
Seattle, WA 98104

May 27, 2016

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

BOD	basis of design
CRETE	CRETE Consulting, Inc.
DEQ	Oregon Department of Environmental Quality
DMMA	disposal material management area
EES	Easement and Equitable Servitude
EOS	EVRAZ Oregon Steel
EPA	U.S. Environmental Protection Agency
Integral	Integral Consulting Inc.
JSCS	Joint Source Control Strategy
OHW	ordinary high water
PCB	polychlorinated biphenyl
NGVD29	National Geodetic Vertical Datum of 1929
NPDES	National Pollutant Discharge Elimination System
RBC	risk-based concentration
ROD	record of decision
SCE	source control evaluation
SCM	source control measure
SLV	screening level value
Strider	Strider Construction Company
TPH	total petroleum hydrocarbons
USACE	U.S. Army Corps of Engineers
WCRA	Willamette Cultural Resources Associates, Ltd.

CERTIFICATION STATEMENT

Construction Completion Report
Riverbank Source Control Measure

This report has been prepared by the staff of Integral Consulting Inc. and CRETE Consulting, Inc. under the professional supervision of the people whose seal and signature appear hereon.

Integral Consulting Inc.

Craig Heimbucher, P.E.
Oregon State PE Number: 83605PE

CRETE Consulting, Inc.

Michael Byers, P.E.
Oregon State PE Number: 64468PE

Based on direct observation made by CRETE Consulting, Inc. personnel, materials testing, laboratory testing, and other construction documentation described in this report, it is the opinion of the undersigned that the source control measure for the riverbank portion of the EVRAZ Oregon Steel facility located at 14400 North Rivergate Boulevard, Portland, Oregon, has been constructed in substantial compliance with the intended design document (*EVRAZ Oregon Steel Final Design Report for the Riverbank Source Control Measure*, June 18, 2015). The material and data for this Riverbank Source Control Measure as presented in this report were prepared under supervision and direction of the undersigned.

CRETE Consulting, Inc.

Michael Byers, P.E.
Oregon State PE Number: 64468PE

COMPLIANCE CERTIFICATION

U.S. Army Corps of Engineers, Portland District
CENWP-OD-GP
P.O. Box 2946
Portland, Oregon 97208-2946

1. Permittee Name: Evraz Oregon Steel, 14400 North Rivergate Road, Portland, Oregon 97203

2. County: Multnomah

3. Corps Permit No: NWP-2007-900-1

4. Corps Contact: Compliance Project Manager for Multnomah County

5. Type of Activity: **Nationwide Permit (NWP) No. 38 (Cleanup of Hazardous Materials and Toxic Waste)**

Please sign and return form to the address above:

I hereby certify that the work authorized the above referenced permit has been completed in accordance with the terms and conditions of said permit and that required mitigation is completed in accordance with the permit conditions, except as described below.

5/27/16

Signature of Permittee **Date**

....

Professional Archaeologist Signature:

I hereby certify that the work authorized by the above referenced permit has been monitored for cultural resources and/or human remains during all ground disturbance activities in accordance with the terms and conditions of said permit. In the event cultural resources and/or human remains were discovered, all appropriate Federal, State, and local authorities have been notified.

Kanan Paran May 26, 2016

Signature of Archaeologist **Date**

Willamette Cultural Resources Associates, Ltd.

Organization/Affiliation

1 INTRODUCTION

EVRAZ Oregon Steel (EOS) implemented a source control measure (SCM) removing and stabilizing contaminants in the riverbank at its Rivergate property in Portland, Oregon (Figure 1). The Riverbank SCM was an interim remedial measure implemented under terms of the June 2000 Voluntary Agreement for Remedial Investigation and Source Control Measures between Oregon Department of Environmental Quality (DEQ) and EOS (DEQ 2000). The overall approach for the Riverbank SCM was described in DEQ's record of decision (ROD) for the EOS shoreline (DEQ 2014). The EOS riverbank lies within the Portland Harbor Superfund site study area, and the U.S. Environmental Protection Agency (EPA) concurred with the remedial approach described in the DEQ ROD. Project permits were issued in December 2014, and riverbank construction was completed in 2015, with planting extending into early 2016.

The Riverbank SCM mitigates the potential for the transport of impacted soil from the riverbank and upper beach to the Willamette River. The Riverbank SCM construction implementation consisted of excavation and backfilling of the bank, upper beach, and berm. Soil was removed from the bank to design grade, the slope was regraded, a filtration layer was constructed, and the bank was armored/capped. A removal action was implemented on the upper beach, followed by backfilling to approximately pre-excavation grades with clean, well-graded river gravel and cobble. Berm soils above the bank were excavated to prevent sloughing during bank excavation. The berm was rebuilt with imported aggregate and topsoil following bank stabilization. Following construction activities, 0.73 acre of the upper beach above 12 ft National Geodetic Vertical Datum of 1929 (NGVD29) was planted with more than 3,300 native shrubs and trees. Jute matting was placed on steep topsoil slopes to prevent erosion, and both steep and gradual/flat slopes were hydroseeded. Approximately 1.74 acres of berm riparian areas were planted with more than 6,000 native trees and shrubs.

Design and construction for the Riverbank SCM were based on the *Riverbank Source Control Evaluation Report* (SCE report; RETEC 2006), the *Revised Basis of Design/Conceptual Design for Upper Beach and Riverbank Interim Action* memorandum (BOD memo; AECOM and Integral 2013), and subsequent evaluations conducted with input from DEQ and permitting agencies. A final design report and construction package (design report) was approved by DEQ on June 22, 2015 (Integral and CRETE 2015). Construction on the Riverbank SCM was implemented between July 1, 2015, and November 11, 2015, with work below ordinary high water (OHW) completed by October 20, 2015. Planting on the upper beach and riparian slopes occurred in February 2016, and limited hydroseeding and irrigation system installation were completed in March 2016.

This completion report provides an overview of the Riverbank SCM implementation; as-built construction drawings are included in Attachment A.

2 RIVERBANK SCM DESIGN

Design and construction of the Riverbank SCM was constrained by riverbank morphology. The riverbank is subdivided vertically and laterally (along the shoreline) into geomorphic areas. Elements of the design vary based on location. Figures 2 and 3 show the subdivided areas and the nomenclature used to describe each area. Vertically, the Riverbank SCM includes the upper beach, bank face, and berm. The upper beach consists of the gently sloping area from mean high water at +9.6 ft NGVD29 to the base of the steeper bank face at approximately +15 ft NGVD29. The steeper bank face extends above the upper beach and ranged in pre-construction height from less than 4 ft in the northern portion of the project area to approximately 11 ft in the central portion of the project area. The area above and landward of the bank face is the vegetated berm, which had a maximum pre-construction elevation of approximately +35 to +40 ft NGVD29. The berm separates the interior of the EOS site from the shoreline. Landward of the berm, the active steel mill includes a perimeter road, rail line, and steel mill buildings.

Laterally along the shoreline, the project area includes the southern riverbank, the main project area, and the north alcove. The slag-soil fill, which forms the bank across much of the project area, is absent in the southern portion. The north alcove is the 300-ft reach on the north end of the project area (Figure 3). The upland berm that is present for most of the project area is not present in the majority of the north alcove. The bank face is shorter, more gradually sloped, and less well-defined, and the upper beach extends farther inland to a higher elevation than the rest of the project area. The north alcove was well-suited for habitat enhancements, which were included in the design.

2.1 DESIGN OBJECTIVES

The Riverbank SCM provides environmental benefits by removing, capping, and stabilizing the riverbank to prevent releases of contaminants. The Riverbank SCM also incorporates restoration and enhancement of the habitat in the riverbank area.

The Riverbank SCM design objectives were as follows:

- Prevent erosion of polychlorinated biphenyl (PCB) and metal[1]-contaminated soil to the river at concentrations that exceed risk-based levels, or background levels where risk-based levels are below background
- Employ measures that will be compatible with future remedial measures designed to address contaminated sediment adjacent to the upper beach
- Maintain or improve existing aquatic and riparian habitat along the riverbank.

[1] Metals include arsenic, cadmium, chromium, copper, lead, manganese, and zinc.

The Riverbank SCM is an interim action because EPA will assess the sufficiency of the action based on the conclusions of the Portland Harbor Superfund site ROD. However, for the portion of the bank and beach addressed in this Riverbank SCM, DEQ considers the Riverbank SCM a final action. EPA will assess the need for action on sediments riverward of the upper beach as part of remedial actions for the Portland Harbor Superfund site. Therefore, the Riverbank SCM was designed for compatibility with future remedies selected for Portland Harbor.

2.2 BASIS OF DESIGN

Chemical and physical characteristics identified in the SCE report and BOD memo that were used to develop the Riverbank SCM design included:

- Locations of total PCB concentrations greater than Joint Source Control Strategy (JSCS; DEQ and USEPA 2005) toxicity screening level values (SLVs) along the riverbank and greater than 100 μg/kg along the upper beach
- Locations of metals concentrations greater than JSCS SLVs along the riverbank and upper beach
- Distribution of PCB-containing slag-soil fill material in the riverbank
- Space constraints associated with steel mill operations located adjacent to the berm at the top of the riverbank, necessitating a steep bank slope geometry
- Willamette River forces generated by boat wakes and river currents along the upper beach and riverbank
- Rock armor cap sized to ensure slope stability and prevent mobilization of underlying slag-soil fill, including during extreme flood events (i.e., a 100-year flood event)
- Post-construction no net rise in base flood elevation during peak discharge of a 100-year flood event, and no net filling within the river floodway
- Slope stability under short-term construction and long-term static conditions, and when subject to a design level earthquake with a 475-year recurrence interval
- Upper beach removal compatibility with the future EPA action for the sediments riverward of the upper beach
- Beach substrate capable of withstanding erosive forces, while maintaining some capacity to move, re-sort, and be acceptable as fish habitat
- Berm configuration for protection of mill operations during high water events, as an environmental buffer and to control direct stormwater runoff to the Willamette River
- Habitat considerations designed to meet or exceed pre-construction conditions, including dense planting on the berm and upper beach, rock armor footprint

minimization, and construction of a habitat corridor between beach and upland riparian areas.

Chemical testing was completed in transects across the upper beach, bank face, and berm (Figures 4–7). Sampling results of 94 soil samples collected between 2000 and 2014 delineated areas to be stabilized or removed as part of the Riverbank SCM. The Riverbank SCE report presented the initial delineation of the SCM remedial footprint. The *Revised EOS Additional Riverbank and Upper Beach Soil Sampling Report* (AECOM 2011) and *Data Report for Berm, Upper Beach, and North Alcove Soil Sampling* memorandum (Integral 2015) included additional data and analysis for refinement of the footprint.

The riverbank armor is required to remain stable and prevent erosion of the PCB-containing slag-soil fill layer when subject to river forces. The finished horizontal to vertical bank slope of 1.5:1 minimizes the horizontal footprint of rock armor, protects the geotextile filtration fabric (which stabilizes the remaining slag-soil fill), and provides lateral connection between mature trees on the upper beach and upland riparian areas. The upland riparian native vegetation planted on the reconstructed berm provides beneficial habitat.

Beach substrate provides sufficient stability to support the toe of the bank armor structure and protect it from undermining while also supporting habitat by allowing for planting and some natural movement and re-sorting of material.

2.3 DESIGN ELEMENTS

The project included the following elements for each of the geomorphic areas:

- Upper Beach Source Control Measure—Excavation, backfill, and vegetation restoration. In general, upper beach areas with total PCBs concentrations greater than 100 μg/kg were removed. Final excavation depths ranged between 1.5 and 3 ft in most areas, and up to 5 ft below grade in localized areas (Figure 4). In three locations where remaining total PCBs concentrations exceeded 100 μg/kg at a final excavated depth of 3 ft below grade, monitoring stakes were installed to assess potential long-term erosion of the imported beach material.
- Bank Source Control Measure—Excavation, stabilization with geotextile filtration fabric, and protection by rock armor. Capping of the bank and removal along the southern bank addressed soils with total PCBs concentrations above the JSCS toxicity SLV of 676 μg/kg. Total PCBs concentrations in bank soils along the EOS shoreline but outside of the armored bank are significantly lower than the JSCS toxicity SLV (Figure 8).
- Berm Soil Stabilization—Removal, as needed, for bank construction and rebuilding with imported soil followed by vegetative restoration. The western portions of the berm were removed to accommodate bank stabilization. After bank construction, the overlying

berm was backfilled and stabilized by placing geotextile layers within the backfilled imported soil. Jute matting was placed on the steep berm surfaces, and gradual surfaces were hydroseeded to stabilize the topsoil and protect against erosion until planted vegetation becomes established.

- Habitat Considerations and Vegetation Restoration—Restoration and enhancement of additional riparian habitat. Design on the north end of the project utilized existing physical features to enhance habitat features, and dense native vegetation was planted following construction over the majority of the project area.
- Management of Excavated Soil—Excavated bank soil with higher PCB concentrations was disposed of offsite at a Subtitle D landfill. Upper beach material with higher concentrations was managed in the former melt shop mold basement. Upper beach material with lower concentrations was managed at the onsite permitted landfill and was capped with soil from the berm meeting risk-based criteria, or with clean fill.

3 CONSTRUCTION ACTIVITIES

Construction activities were completed along a 1,986 lineal foot reach of shoreline. This included a 1,675 lineal foot continuous reach beginning approximately 250 ft south of the northern property boundary, and an additional 70 lineal foot section of bank and berm near the southern property boundary (see Attachment A). Project activities encompassed a total of 4.25 acres. Excavation activities encompassed a total of 2.92 acres.

The majority of construction activities occurred between July 8, 2015, and November 11, 2015. All work below OHW was completed between July 8 and October 20, 2015, during the in-water work window. Fall planting on steep riparian slopes was completed between November 13 and November 20, 2015. Winter planting on the upper beach and gradual riparian slopes was completed between February 1 and March 5, 2016. Spring seeding was completed by March 25, 2016.

Integral Consulting Inc. (Integral) was the overall project coordinator and lead consultant for the construction project, and provided general project management, daily field oversight, and coordination, including sampling and monitoring. All work was conducted in coordination with and under the supervision of CRETE Consulting, Inc. (CRETE), the Engineer of Record for the project. Herrera Environmental Consultants, Inc. was the landscaper for the project and provided oversight during the implementation of the planting plan. Willamette Cultural Resources Associates, Ltd. (WCRA) performed cultural resources monitoring during excavation activities as required by the project permits and design report.

Strider Construction Company (Strider) was the General Contractor for the project and completed excavation, backfill, grading final surfaces, loading of soil for offsite disposal, erosion control services, and placement of soils for onsite soil management. Holt Services Inc. completed well decommissioning. Anderson Erosion Control installed the plants and completed hydroseeding. Soil and debris was transported for offsite disposal by Ray Mohoff Trucking.

3.1 SITE PREPARATION

Site preparation activities were completed prior to riverbank SCM excavation activities and included the following:

- Securing permits and approvals
- Installing temporary site facilities and controls
- Installing temporary erosion and sediment controls
- Delineating and protecting the wetland on the upper beach

- Upper beach and berm monitoring well decommissioning
- Surface clearing of existing vegetation.

3.1.1 Permits and Approvals

DEQ approved the Riverbank SCM design via letter correspondence on June 22, 2015. EPA supported DEQ in design review and concurred with the approval[2]. Other local, state, and federal approvals, notifications, and permits secured prior to implementation of the Riverbank SCM included the following:

- U.S. Army Corps of Engineers (USACE) Nationwide Permit (NWP No. 33)—Temporary Construction, Access and Dewatering (USACE No. NWP-2007-900-1)
- USACE NWP No. 38—Cleanup of Hazardous Material and Toxic Waste (USACE No. NWP-2007-900-1)
- National Oceanic and Atmospheric Administration Fisheries Biological Opinion and Incidental Take Statement, WCR-2014-1583
- Oregon Department of State Lands Removal/Fill Permit Waiver, 56190-PW (Modified)
- DEQ National Pollutant Discharge Elimination System (NPDES) 1200-C Construction Stormwater Discharge General Permit, EPA Number ORR10D966, DEQ File Number 124120
- City of Portland Bureau of Development Services Substantial Conformance Determination (File #07-185156 PR).

Weekly meetings were held onsite with DEQ during construction activities to discuss project status and progress. These weekly meetings included a meeting with EPA on September 22, 2015. Weekly progress reports were submitted to DEQ during project implementation (Attachment B).

3.1.2 Temporary Facilities and Controls

Temporary site facilities and controls were provided by Strider. Approximate locations of the temporary facilities are provided in the construction drawings. Portable equipment trailers were brought onsite and set up in a parking and storage area south of the EOS Energy and Environment office prior to commencement of the work. These trailers were used as a meeting space and to store equipment, health and safety supplies, and field supplies for Strider.

[2] Muza, R. 2014. Personal communication (letter to M. McClincy, Oregon Department of Environmental Quality, dated August 7, 2014, regarding EPA review of final source control measure for the Evraz Oregon Steel Mill Riverbank. U.S. Environmental Protection Agency, Region 10, Oregon Operations Office, Portland, OR.

Access to the EOS steel mill is restricted and monitored by security 24 hours a day. Access to the project area was controlled during the duration of the work by construction fencing installed between the main mill road and the berm. Signage was installed along the construction fencing to notify EOS employees of the active work area. A sediment fence was placed riverward of the construction area during excavation activities.

A haul route was established for trucks entering, exiting, and driving on the EOS property (Figure 9).

To temporarily stage material designated for landfill disposal, a disposal material management area (DMMA) was constructed on the east side of the EOS facility adjacent to the east side of main employee parking lot. Ultra Blocks® were used to delineate and contain the DMMA, and an impermeable liner was installed underneath the DMMA to contain the soil and allow for management of stormwater, if necessary. Straw wattles were also placed on the south side of the DMMA to prevent discharge of stormwater runoff from the area. All soils placed in the DMMA were covered with plastic sheeting, which was weighted down with sandbags at the end of each day to prevent dust generation and prevent exposure of stockpiled soil to stormwater. The DMMA was primarily used to stage slag-soil material excavated from the bank prior to loading and transporting offsite for disposal at an approved Subtitle D landfill. A small quantity of gray soil encountered during the upper beach excavation was also staged in the DMMA prior to analytical evaluation and management onsite, as discussed in Section 3.3.1.

Utilities within the project area identified in the construction drawings and by EOS personnel were field-located and verified by Strider. The following utilities were identified, and protection was implemented, as necessary:

- A 42-in. stormwater pipe and utility trench is located both above and below ground surface along the berm and parallel to the bank north of the dock. Steel plates were placed at equipment crossings, and equipment was not stored on top of the pipe. Temporary supports were installed at the Central Outfall (001) pump station where bank excavation extended into the footprint of the pipe stands. After bank construction was completed, the footings and pipe stands were reconstructed and replaced.
- A 30-in. service water pipe is located above-grade north of the dock. Contact with this pipe was avoided during construction activities.
- A utility trench is located outside the project area, and steel plates were placed at equipment crossings over the trench.
- A natural gas line extends from the south side of the dock to end of project area. Steel plates were placed at equipment crossings over the gas line.
- A natural gas main line is located south of the project area near the southwest corner of the property. A spotter was employed to direct construction traffic and ensure the

above-ground stickups were not damaged or compromised where the main line crosses onto the property. No excavation was conducted along the gas main line crossing.

- A 36-in. high-density polyethylene active stormwater outfall pipe and a 36-in. steel emergency stormwater outfall pipe were visually located and marked prior to excavating the bank in each area. Care was taken when excavating around the pipes to ensure the excavator bucket, rocks, or other adjacent materials did not puncture the pipes. Any material above the excavation limits and attached to the pipe were removed using hand tools.

3.1.3 Preparation of Onsite Soil Management Facilities

Upper beach and berm soils were managed in two onsite areas, the north side of the east landfill and the mold basement in the former melt shop. Total PCBs concentrations in excavated upper beach and berm soils were generally below site-specific human health risk-based concentrations (RBCs) and background subsurface and surface screening criteria, respectively (AECOM and Integral 2014). DEQ approved the placement of soil at these locations per the soil management plan (Integral and CRETE 2015; Attachment C).

Preparation of the east landfill included estimating available space for soil filling on the north side of the east landfill, evaluating drainage to confirm that stormwater would not drain from the area, and determining the best haul route and grading the access road.

Preparation of the mold basement included inspection of the mold basement prior to filling and installation of temporary fencing to control and limit access. Filter fabric inserts designed to trap stormwater sediments were installed in storm drain catch basins located in the roadway at the south entrance to the former melt shop.

3.1.4 Temporary Erosion and Sediment Control Measures

An erosion and sediment control plan was prepared by Integral and CRETE and approved by DEQ for coverage under the NPDES 1200-C Construction Stormwater Discharge General Permit (Integral and CRETE 2015). This plan was included in the final construction design documents. Permit coverage was transferred to Strider, which implemented and maintained the temporary erosion and sediment control measures during construction. Strider employed a Certified Erosion and Sediment Control Lead to conduct routine site inspections. Erosion and sediment control best management practices included catch basin inlet protection, perimeter controls (sediment fence and straw wattles), the DMMA, and dust control. With final stabilization of the site, the 1200-C permit was terminated and confirmation was received from DEQ on March 30, 2016 (Attachment D).

3.1.5 Temporary Beach Access Ramps

Beach access ramps were constructed at Stations 4+50, 8+00, 15+50, and 16+50. Ramps were constructed using excavated berm soil and track walked or rolled to provide a compacted surface with sufficient stability for driving construction equipment. At the entrance to each of the beach access ramps, a layer of quarry spall was placed to improve the stability of the ramp and minimize track out of soils between mill roads and the upper beach. Narrow or constrained points on the ramps were marked with traffic cones to hold equipment a safe distance from the edges. Sediment fencing was installed riverward of the beach access ramps as a best management practice. As construction progressed, the beach access ramps were removed, and the berm and bank were reconstructed to complete the shoreline stabilization. The excavated berm soil used to construct the access ramps was pulled back and used to reconstruct the back side of the berm in the area where the accessed roads were excavated. The front side of the berm was reconstructed to final design grades using imported berm material and topsoil.

3.1.6 Monitoring Well Abandonment

Monitoring wells were abandoned by Holt Services Inc. (under subcontract to Strider) from July 27 to 29, 2015, in accordance with the Rules for the Construction, Maintenance, Alteration, Conversion, and Abandonment of Monitoring Wells, Geotechnical Holes, and Other Holes in Oregon (OAR chapter 690, division 240). A total of 13 monitoring wells on the berm and upper beach and located within or near the riverbank construction activities were decommissioned by overdrilling using a hollow stem auger and backfilling with bentonite chips as part of the construction activities. The remaining onsite monitoring well, MW-11, located near the berm on the north end of the project, was protected during construction activities. Well abandonment reports were prepared by Holt Services Inc. and submitted to the Oregon Water Resources Board, and are included in Attachment E.

3.2 CLEARING AND WOODY DEBRIS REMOVAL

Tree clearing and large woody debris removal commenced following installation of the temporary erosion and sediment control measures and beach access roads. Large downed trees with a trunk diameter exceeding 1 ft were temporarily relocated north or south of the active excavation areas using hydraulic excavators. Following completion of the bank stabilization work, these large pieces of woody debris were repositioned along the upper beach as a habitat enhancement feature. Smaller woody debris less than 1 ft in diameter was collected using a combination of excavators, loaders, and by hand. This material was stockpiled for chipping in a designated management area located in the northeast portion of the mill property. During the chipping process, material that could not be chipped, including woody debris with impurities (concrete, rock, and metal) was segregated out of the main pile. The chipped woody debris with no impurities was stockpiled onsite for future use. The pile of segregated woody debris with impurities was then further separated into two smaller stockpiles: one consisting of non-woody debris (including slag encased in wood), and one consisting of only woody debris. The woody stockpile was disposed of offsite without chipping at an approved wood recycling facility, and the debris stockpile was disposed of at an approved Subtitle D landfill (see Section 3.4).

3.3 RIVERBANK CONSTRUCTION

Elements of the Riverbank SCM construction included berm, beach, and bank excavation; stabilization of the bank with geotextile filtration fabric, crushed rock, and rock armor backfill; and backfill of the berm and beach. Work below the OHW elevation of 16.6 ft NGVD29 was completed during the in-water work window (between July 1, 2015, and October 20, 2015).

3.3.1 Berm, Bank, Upper Beach, and Alcove Excavation

Excavation of the riverward side and top of the majority of the berm (above the area for bank face removal) was conducted to prevent soil from sloughing during bank stabilization. Berm excavation was completed between July 20 and 27, 2015, immediately following the vegetation clearing and woody debris removal. Berm material was removed from Station 8+00 to 15+50 and Station 16+25 to 19+15.6. Because of the geometry of the berm on the north end of the project between Stations 2+50 and 8+00, berm excavation was not required as it did not impact bank stabilization construction.

Excavation of the berm was conducted by working from the top of the berm using excavators. Excavated berm material was placed in off-road haul trucks for onsite transport. All berm material was temporarily stockpiled prior to use as surface soil on the north side of the east landfill, as discussed below. Some of the excavated berm material was used for constructing temporary beach access ramps as described in Section 3.1.5. The berm slopes were not immediately backfilled; they were covered with plastic sheeting to prevent erosion and to maintain stability.

The slag-soil fill layer that comprised the bank face was excavated using an excavator positioned at the toe of the slope on the upper beach. All bank face excavation work was completed in the dry. With the exception of bank face sections underneath two temporary beach access haul roads, bank face excavation was completed between July 27, 2015, and August 10, 2015. Bank face excavation for sections beneath the haul roads was completed by October 6, 2015. In general, the bank face was excavated by pulling material down towards the excavator and loading into off-road haul trucks staged on the upper beach. A mini-excavator, vactor truck, and hand tools were used to excavate material under the dock and around dock pilings. In areas with minimal clearance, deck boards were temporarily removed from the dock to access, excavate soil, and backfill.

The small sections of the bank face located underneath the temporary access roads were excavated from the top of the bank after the roads were removed. All excavated bank material was transported to the DMMA and stockpiled prior to offsite disposal. The bank face was excavated to a stable horizontal to vertical design slope of 1.5:1.

An isolated pocket of PCB-impacted bank soil located south of the main stabilization area between Stations 21+60 and 22+50, and between the elevations of 16 and 30 ft NGVD29, was identified for removal. This material was excavated from the top of the bank to a final depth of 2.5 ft.

Upper beach and north alcove excavation was completed between August 20, 2015, and October 20, 2015[3], and included excavation of beach soil as dictated by pre-construction beach sampling, and as necessary to construct the trench toe required for stabilization of the reconstructed slope. Upper beach removal occurred between surface grade elevations of 9.6 ft NGVD29 (mean high water) and the toe of the bank at an approximate elevation of 15 ft NGVD29. The final depth of upper beach and north alcove excavation ranged between 1.5 and 5 ft below surface grade. Because of low river and groundwater levels during the work window, minimal groundwater was encountered during beach excavation. The north alcove removal extended further inland (and to a higher elevation) than the upper beach in the main stabilization area, with a maximum surface grade elevation of 25 ft NGVD29. Upper beach and north alcove excavation was completed using an excavator, and soil was hauled to designated locations using off-road haul trucks. Given the low total PCBs and metals concentrations identified during previous upper beach and north alcove soil sampling, onsite soil management locations were utilized for final placement of excavated north alcove and beach soils (Integral and CRETE 2015). Excavated upper beach and north alcove material was transported either to the north side of the east landfill or to the mold basement.

On August 25, 2015, approximately 30 cubic yards of excavated soil with an organic odor was excavated from beach soils in the vicinity of Station 7+40. Immediately upon noting this odor, excavated soil from this area was stockpiled in a designated location within the DMMA. A five-point composite sample was collected from this stockpile and analyzed for total petroleum hydrocarbons (TPH) in the gasoline, diesel, and residual ranges. Analytical results of the sample did not detect TPH, and as a result these soils were transported to the mold basement for onsite management.

[3] Following elevation survey of the final surface, some additional imported beach material placed in the North Alcove was needed to achieve the design elevation grade. This additional placement of fill occurred above OHW in November 2015.

3.3.2 Berm, Bank Face, Upper Beach, and North Alcove Backfill

Imported material used for backfilling excavations included rock armor, crushed rock, imported beach material (rounded river rock and sand), imported berm material (well-graded sand), and topsoil. Imported upper beach and berm fill material met the physical requirements listed in Table 1. Imported topsoil met the physical requirements listed in Table 2. With the exception of the rock armor, chemical analysis was completed on all material prior to import. Chemical analysis included dioxins/furans, PCB Aroclors, metals, semivolatile organic compounds, and pesticides (Attachment F). Analytical results for each material were reviewed and approved by DEQ prior to acceptance onsite (Attachment G). In the case of the crushed rock, the fine-grained portion was screened from the coarser fraction and analyzed.

Bank face and toe reconstruction occurred between August 5, 2015, and October 6, 2015. This work consisted of placing a geotextile filtration fabric on the surface of the final bank excavation slope, placement of 1.5-in.-minus crushed rock on the surface of the geotextile, and placement of Class 2000 rock armor on top of the crushed rock. The imported 1.5-in. crushed rock and Class 2000 rock armor met the physical specifications listed in Table 1. The total post-construction footprint of the rock armor section is 0.96 acre.

Because of the steepness of the bank slopes, placement of the crushed rock layer was completed using the following technique:

- Geotextile was rolled out from the top of bank down to toe and positioned in place as shown on drawings.
- A 1-ft-thick layer of 1.5-in.-minus crushed rock was placed in the base of the toe excavation.
- A 10- by 8-ft steel plate was positioned at the toe on the bank slope using an excavator. Crushed rock was placed below the steel plate and Class 2000 rock armor was placed above the steel plate as the plate was lifted up to the final plan elevation in a manner similar to concrete slip-form construction. This sequential slip-form operation allowed Strider to construct the elements of the stabilization as designed.

In the areas excavated by hand and vactor truck underneath the dock, Class 200 rock armor was placed by hand.

The small excavated area south of the main bank stabilization was backfilled with 1 ft of Class 50 rock armor on September 28, 2015, followed by placement of 1.5 ft of imported topsoil on October 19, 2015.

Backfilling of the upper beach and north alcove was completed between August 20, 2015, and October 20, 2015. All upper beach and north alcove areas excavated below OHW were backfilled the same day as the excavation. Imported beach material consisted of a 12-in.-minus rounded river rock and sand blend (Table 1). Both the excavator bucket and the off-road trucks were decontaminated prior to placement of the clean imported beach material. The excavator worked at all times with tracks placed on the unexcavated beach to prevent tracking over the clean import material. All equipment was decontaminated and inspected prior to driving on areas where clean import material was placed.

Reconstruction of the riverward side of the berm was conducted after the bank face and beach work was completed. Berm reconstruction activities were completed between October 20, 2015, and November 5, 2015. For the majority of the berm, reconstruction included placement and compaction of imported berm material followed by placement of approximately 2 ft of imported topsoil on top of the imported berm material. Between Stations 2+50 and 8+00 where the berm was not excavated, 1 ft of imported topsoil was placed over the entire berm (Attachment A, Sheet D-087). Imported berm material and topsoil were placed in lifts using a truck with a conveyor belt staged on the mill side of the berm. A reinforcement geogrid material was placed between lifts, and the berm material was compacted using hand tampers/plated before the next lift was placed. Following topsoil placement, jute matting was secured over the topsoil surface on the steep slopes to help stabilize berm material and minimize erosion.

The original design of the constructed berm was modified during construction to provide a thicker layer of planting soil to enhance the overall moisture retention of the berm backfill. The change consisted of increasing the thickness of the planting soil to 2 ft (as measured perpendicular to the slope surface), decreasing the quantity of aggregate berm backfill to accommodate the thicker planting soil layer, and incorporating the thicker planting soil layer into the geotextile reinforcement layers to maintain the overall stability of the berm. This is shown on the as-built drawing D-08. The modified berm backfill design stability was evaluated in comparison to the original stability analysis (Attachment E "Technical Memorandum—Stability Analysis Riverbank Source Control Measure" of the BOD Memo) to ensure that no stability loss resulted from the change. Attachment H contains a memorandum describing the results of the stability analysis on the modified design. The results indicated that the modified design would not affect the overall slope stability.

Imported berm material and topsoil met the physical specifications listed in Table 1. Prior to import, these materials were subject to chemical testing and approved for use by DEQ following review of the chemical analyses[4] (Attachment G). All berm work was completed above OHW.

[4] Chemical analyses for imported berm material and topsoil materials included dioxins/furans, PCB Aroclors, pesticides, semivolatile organic compounds, and metals. A complete list of analytes and initial screening criteria are included in Table 3.

3.4 WASTE PROFILING, TRANSPORTATION, AND DISPOSAL

Materials disposed or recycled offsite included soil from the bank face (slag-soil fill), debris, and wood. Bank soils and debris were characterized and profiled as non-hazardous for disposal at a Subtitle D landfill based largely on existing data. Due to higher metals concentrations in the bank material, five four-point composite samples were collected from the bank face and analyzed for toxicity characteristic leaching procedure metals prior to construction. Results showed that the bank soils were nonhazardous (Attachment I). In addition, the landfill requested TPH analyses of the bank face soil for disposal characterization. Diesel-range organic concentrations ranged from below detection to 33 mg/kg and residual-range organic concentrations ranged from below detection to 710 mg/kg. Results are included in Attachment I.

Disposal of each waste stream was coordinated with Waste Management and managed as described below, and disposal receipts are included in Attachment J.

3.4.1 Bank Slag-Soil Material

All material excavated from the bank was temporarily stockpiled in the DMMA located north of the main gate at the EOS facility (Figure 9). An excavator was used to load material into over-the-road trucks and trailers for transport to the landfill. A total of 14,000 tons (440 truck and trailer loads) of bank slag-soil material was disposed of as daily cover at Riverbend Landfill in McMinnville, Oregon.

3.4.2 Tree Stumps

Trees were cut at the ground surface during the initial clearing of the berm and bank. Stumps were then removed and managed separate from the other woody debris as required by the landfill for disposal purposes. A total of 67 tons of tree stumps were disposed of at Hillsboro Landfill in Hillsboro, Oregon.

3.4.3 Woody Debris and Other Miscellaneous Debris

Miscellaneous debris (concrete, rock, and metal as described in Section 3.2) encountered during chipping was further separated into two stockpiles: one consisting of mixed wood and miscellaneous debris and one consisting of remaining woody debris. Approximately 100 cubic yards of woody debris was transported for recycling to Tualatin Valley Waste Recycling at Hillsboro Landfill. A total of 194 tons of mixed wood and miscellaneous debris was transported to Hillsboro Landfill for solid waste disposal.

3.5 ONSITE SOIL MANAGEMENT

Soil excavated from the berm and upper beach were characterized prior to construction and had low concentrations of total PCBs and metals. This soil was managed onsite at two locations as described in Section 3.1.3. The design report identified PCBs and metals criteria for upland surface and subsurface soil management based on site-specific human health RBCs, DEQ generic RBCs, and background. The majority of the berm and upper beach soil managed onsite was below these criteria. EOS prepared an upland soil management plan for managing excavated beach and berm material onsite at two upland areas at the mill that do not pose an ecological risk, do not provide a direct erosion or stormwater pathway to the Willamette River, and are relatively low-use areas on the facility (Attachment C). The design and management measures described in the soil management plan result in soil management protective of human health exposures.

The two onsite soil management areas include a narrow strip of unused land on the north side of the east landfill, and a concrete-lined, unused basement in the former melt shop (mold basement). DEQ approved the upland soil management plan in May 2015 (Attachment C). Figure 9 identifies designated upland soil management locations by pre-excavation location on the beach and berm.

Excavated beach soil between Stations 11+40 and 12+50, originally slated for placement in the mold basement, was instead placed on the north side of the east landfill due to volume constraints in the mold basement. This modification from the soil management plan was approved by DEQ during a weekly construction meeting on August 26, 2015. As discussed below, the beach soil placed on the north side of the east landfill was capped with a 1-ft layer of berm material that met site-specific upland surface soil management criteria or imported topsoil previously approved for use on the berm by DEQ.

3.5.1 East Landfill

Excavated beach and berm soils were transported to the north side of the east landfill, and were managed onsite and capped at the location shown on Figure 9. Approximately 4,700 cubic yards of beach soil were placed along the north side of the east landfill in 18-in. lifts and compacted to a non-yielding surface. A geotextile indicator fabric was placed on top of the compacted beach soil. Approximately 1,600 cubic yards of berm soil was placed over the indicator fabric in a 1-ft-thick layer to cap the beach soil and serve as a medium for grass growth. Following placement of all excavated berm soil, additional capping/growing medium was needed to cover approximately one-third of the compacted beach soil and geotextile. Therefore, a 1-ft-thick layer of imported soil (soil meeting the soil import criteria) was used to cover the remainder of the beach soil and geotextile. Jute matting was placed over the soil cap and hydroseeded to stabilize the newly placed fill. Inspection and long-term management of this area are discussed in Attachment K.

Beach soil was excavated from the upper beach, from the north alcove, and from the trench excavated to install the rock armor toe. Much of the beach soil from the trench was located below removed portions of the bank (i.e., below the slag-soil fill layer). In these areas, the overlying slag-soil fill material was over-excavated to include some of the underlying beach soil as a precautionary measure, and disposed offsite. Based on soil characterization prior to construction, approximately 85 percent of the beach soil placed on the north side of the east landfill met surface and subsurface upland soil management criteria and 95 percent met the upland subsurface soil management criteria for total PCBs and metals (Attachment C). Three of the beach samples (approximately 5 percent) had concentrations slightly above subsurface criteria—one sample for arsenic and two samples for manganese. As noted above, this beach soil was placed in the subsurface on the side of a managed landfill.

Excavated berm soil meeting upland surface soil management criteria was used to cap the beach soil and provide substrate for plant growth. Berm soil was characterized in October 2014. Three multi-incremental berm soil samples, consisting of 30 sampling increments each, were collected over the areas slated for excavation (Integral 2014). The three berm samples met upland surface soil management criteria for metals and total PCBs.

3.5.2 Mold Basement

The melt shop at the mill has been taken out of service and its mold basement is unused. The mold basement floors and walls are constructed of a 2.5-ft-thick layer of reinforced concrete (Integral and CRETE 2015). Approximately 3,700 cubic yards of excavated beach soil from the upper beach was placed and compacted in the mold basement. Beach soil was placed and compacted in lifts in the mold basement to within approximately 8 in. of surrounding surface grade. A geotextile indicator fabric was placed on top of the compacted soil, and 6 in. of imported crushed rock was placed and compacted on top of the indicator fabric. Inspection and long-term management of this area are discussed in the monitoring and maintenance plan (Attachment K).

Beach soil placed in the mold basement was excavated from the upper beach, the northern alcove, and from the trench excavated to install the rock armor toe. Based on pre-construction sampling, more than 60 percent of the material placed in the mold basement met both surface and subsurface upland soil management criteria (Attachment I) and approximately 85 percent of the material met subsurface upland soil management criteria. Two samples slightly exceeded upland subsurface soil management criteria for total PCBs, and one sample exceeded the upland subsurface soil management criteria for arsenic. The soils in the mold basement will be managed under the monitoring and maintenance plan (Attachment K). As noted above, the mold basement backfill was capped with 6 in. of imported crushed rock, and the area will be inspected and managed.

3.6 SITE RESTORATION AND PLANTING

Site restoration and planting included using a 12-in.-minus rounded river rock backfill material for the upper beach, extending the beach landward on the north end of the project, constructing a habitat connectivity pathway between the beach and berm, minimizing the rock armor footprint, and extensive planting of native vegetation on the berm and upper beach. Planting on the berm and upper beach and hydroseeding of the berm occurred between October 27, 2015, and March 22, 2016. The project incorporates 2.47 acres of native tree/shrub habitat. This includes 0.73 acre of native trees and shrubs in the upper beach from +12 to +15 ft NGVD29 and 1.74 acres of aggressive riparian habitat plantings in the riparian zone (above +28.5 ft NGVD29) (Attachment A, Sheets D-09 to D-11). An additional 0.11 acres of native trees and shrubs were planted on the upper beach north of the project area at the request of DEQ.

Imported upper beach backfill material consists of a well-graded beach substrate that ranges from 12-in. to sand. This mixture provides necessary stability, supports vegetation growth, and results in a surface gradation of materials dynamically stable in the shoreline environment. Depth of imported beach material ranges from 1.5 to 5 ft, as discussed in Section 3.3.2. Large woody debris exceeding 1 ft in diameter was removed from the upper beach during construction and replaced following beach backfilling to provide upper beach structure and habitat refuge.

The upper beach in the northern alcove was extended inland to a higher elevation (approximately 20 ft NGVD29) than the upper beach south of the north alcove. This resulted in reduced height and width of the rock armor slope, and maximizes upper beach habitat. A connectivity pathway (habitat corridor) across the rock armor between the beach and upland forested riparian area was constructed of finer gravel in this area.

Berm reconstruction was completed above the rock armor, which terminated at an elevation of 28.5 ft NGVD29 (1 ft above the 100-year floodplain), and included a 2-ft-thick cap of imported topsoil suitable for supporting new vegetation growth.

The new vegetation on the upper beach in the project area consisted of 331 cottonwood poles and 2,974 willow and dogwood livestakes. Berm planting consisted of a mix of 6,058 native trees and shrubs (Attachment A, Sheets D-09 through D-11). The Riverbank SCM results in no net loss of biological function within the project area.

3.7 CULTURAL RESOURCES MONITORING

Cultural resources monitoring was conducted by WCRA during excavation activities on the north end of the project area between Stations 2+53 and 9+00. Because this area is not directly adjacent to the active mill, it was identified by WCRA in 2008 as having a relatively low potential for discovery of archaeological or historical resources. Cultural resources monitoring south of Station 9+00 was not deemed necessary by WCRA and was not required. Nevertheless, construction workers were trained to halt construction activities and notify WCRA in the event of potential archaeological or historical resources. No archaeological or historical resources were encountered during the project (Attachment L).

4 DATA COLLECTED DURING CONSTRUCTION

Documentation and data collection during construction consisted of turbidity monitoring, post-excavation bank face sampling for PCB Aroclors and metals, and post-excavation beach sampling for PCB Aroclors. With the exception of the rock armor, imported backfill material was sampled and analyzed for PCB Aroclors, metals, dioxins/furans, semivolatile aromatic hydrocarbons, and pesticides prior to DEQ approval and import.

4.1 TURBIDITY MONITORING RESULTS

Turbidity monitoring was conducted during the project for work occurring below OHW, in accordance with the project 401 Water Quality Certification. No occurrences of elevated turbidity were observed. Turbidity monitoring is documented in the weekly activity reports that were submitted to DEQ over the duration of the project (Attachment B).

4.2 BANK INFORMATIONAL SAMPLE RESULTS

Following bank excavation and prior to backfilling, five 10-point composite samples of the slag-soil fill layer from the bank surface after excavation were collected, composited, and analyzed for PCB Aroclors and selected metals. Analyses of soil were completed for informational purposes to document the concentrations of contaminants remaining beneath the constructed stabilization layer and rock armor cap. Sampling procedures are documented in the *Revised Work Plan for Berm, Upper Beach, North Alcove and Bank Face Soil Sampling* memorandum (Integral 2014).

Results indicate that remaining total PCB Aroclors concentrations in soil beneath the stabilization measures and armor cap exceed the JSCS toxicity SLV of 676 µg/kg (DEQ and USEPA 2005), with concentrations ranging from 1,620 to 6,770 µg/kg (Figure 8; Table 4). In general, concentrations in the northern and southern sections of the riverbank project area were slightly lower than central riverbank concentrations.

Bank samples were analyzed for total metals, including arsenic, cadmium, chromium, copper, lead, manganese, and zinc. Samples that exceeded the JSCS toxicity and/or bioaccumulative SLVs for metals included the following:

- Arsenic: BF-2, BF-3, and BF-4 exceeded the bioaccumulative SLV.
- Cadmium: BF-2 and BF-4 exceeded the bioaccumulative SLV.
- Chromium and manganese: All five samples exceeded the toxicity SLV.
- Lead: All five samples exceeded the bioaccumulative SLV.

With the exception of lead concentrations in samples BF-2 and BF-4, all exceedances were within an order of magnitude of the respective SLV. With respect to metals concentrations, metals associated with the slag in the slag-soil fill layer are not readily leachable or bioavailable.

4.3 UPPER BEACH AND NORTH ALCOVE SAMPLE RESULTS

Post-excavation samples were collected from the base of 3-ft excavations in the upper beach and north alcove in areas previously identified as having the potential to exceed screening criteria for total PCBs at a depth of 3 ft below ground surface (Table 4). These post-excavation samples document remaining total PCB Aroclors concentrations in the subsurface beneath the upper beach and north alcove backfill material. Marker stakes were installed in areas where total PCBs concentrations exceeded 0.10 mg/kg at the depth of 3 ft. Marker stake locations are shown on the as-built drawings (Attachment A). The decision unit outlines and marker stakes are shown in Attachment K, Figures 1 and 2.

The areas with the potential for total PCBs concentrations greater than 0.10 mg/kg were subdivided into a total of six decision units. A four-point composite sample was collected from each of the six decision units as shown on Figure 10. Post-excavation analytical laboratory reports are provided in Attachment M.

Samples were collected in accordance with the same general protocols outlined for post-excavation bank face sampling identified in the 2014 sampling plan (Integral 2014). Following sample collection, the excavated areas were backfilled with the imported beach material the same day to minimize the potential for exposure of excavated surfaces during tidally-influenced river level fluctuations.

Results from three of the six decision unit composite samples were above 0.10 mg/kg for total PCBs. Two of the areas were located in the north alcove between Stations 4+00 and 5+25. PCB concentrations in these areas were less than an order of magnitude above the screening criteria. The third area exceeding 0.10 mg/kg for total PCBs was located in the upper beach, north of the dock between Stations 14+60 and 15+75. This upper beach location exceeded the screening criteria by an order of magnitude (Table 3).

In the three areas where composite samples indicated total PCB concentrations exceeded 0.10 mg/kg, marker stakes were installed to assess potential beach erosion as part of the long-term monitoring program (Attachment A, Sheets D-03 and D-05). Three stakes were installed per area. The top of each stake was embedded 2 ft below the final beach grade.

4.4 IMPORT ANALYTICAL SAMPLE RESULTS

Material was imported for backfill of the upper beach, construction of the rock armor cap, and rebuilding of the berm and habitat. Import material was tested, as detailed in the design report, and compared to site-specific import material chemical goals. Results for all import chemical analytical results are listed in Table 3. Import materials were screened against the goals listed in Table 3, which are regional background levels for metals and detection limits for PCB Aroclors, semivolatile organic compounds, dioxins/furans, and pesticides.

Except where noted, sampling was completed in accordance with the protocols outlined in the design report and Attachment N. Correspondence documenting DEQ import material approvals is presented in Attachment G. The following summarizes beach, bank, and berm import material, and discusses chemistry results in relation to the import goals:

- Rock armor used to stabilize the bank slopes was imported from the Yacolt Mountain Quarry located northeast of Lewisville, Washington. Analytical testing was not required for imported rock armor.
- Crushed rock was used to provide a cushion layer between the filtration geotextile and the rock armor. The source of the crushed rock is monolithic basalt from Livingston Mountain near Camas, Washington. Chemical analytical results met all import criteria goals with the exception of copper. Copper exceeded the import goal by less than an order of magnitude, was below 100 mg/kg, and was low in relation to the risk-based values. DEQ approved use of this material.
- Imported beach material was excavated from the Daybreak gravel pit in the Lewis River Valley along the east fork of the river. The pit location is about 1,000 to 2,000 ft from the current riverbed. Chemical analytical results met all import criteria goals.
- Imported berm material (structural berm material beneath the berm topsoil) was composed of material from two sources; the primary component was sand dredged from the Cowlitz River near Kelso, Washington. To achieve the specified gradation, the Cowlitz River material was blended with aggregate from the Carroll Road Quarry in Kelso, Washington. Chemical analytical results met all import criteria goals with the exception of one dioxin congener that slightly exceeded the non-detect import goal. DEQ approved use of this material as berm import fill.
- Topsoil used to support plant growth was placed on top of the berm, or amended with existing soil as documented in Attachment A (Sheets D-09 through D-11). Two sources of topsoil were used. The primary topsoil source consisted of four parts sandy loam from the Molalla River and one part compost from S & H Landscape supply, and was placed on riparian steep slopes and gradual slopes on the river side and top of the berm. A second source of topsoil consisted of a soil/compost blend approved by the City of Portland for use in stormwater bio-infiltration facilities. This topsoil was used on some

sections of the riparian gradual slopes on the steel mill side of the berm, and to amend soil as necessary to support planting in areas undisturbed by construction and in existing vegetation areas. For both topsoil sources, chemical analytical results met import criteria goals except for five dioxin/furan congeners. Concentrations of the dioxin/furan congeners exceeding the non-detect import goals were low in relation to the risk-based values, and each topsoil source was determined to be acceptable for use on the berm by DEQ.

The hydromulch and tackifier used for hydroseeding the berm were analyzed for PCB Aroclors. All results were non-detect for PCB Aroclors (see Attachment F).

5 LONG-TERM MONITORING AND MAINTENANCE AND RESIDUAL RISK

Long-term monitoring and maintenance will be conducted within the project area for the riverbank to achieve two objectives:

- Protection of Human Health and the Environment: Soils exceeding aquatic toxicity screening levels remain in the bank stabilized beneath the rock armor; in three locations within the upper beach, PCB concentrations remain above 100 µg/kg stabilized beneath 3 ft of fill in the upper beach/northern alcove (Figure 6). Monitoring and maintenance will be conducted to ensure that the rock armor stabilization and imported beach material are sufficiently stable and to prevent release of underlying PCBs and metals.
- Maintain Habitat: The riverbank project improved habitat over pre-existing conditions. Monitoring and maintenance will be conducted to confirm that the area remains as habitat.

The long-term monitoring and maintenance plan for the Riverbank SCM is included in Attachment K. This plan includes the 10-year vegetation monitoring plan that was developed and approved by the agencies during the Joint Permit Application approval process. Monitoring and maintenance components for each of the plans are summarized below. In addition, an Easement and Equitable Servitude (EES) will be filed with the property deed.

5.1 MAINTENANCE AND MONITORING

As noted above, maintenance and monitoring will focus on 1) the stability of the reconstructed bank, the riverward face of the berm in the project area, and selected areas on the beach; and 2) habitat survival and growth.

5.1.1 Bank, Berm and Upper Beach Stabilization

Bank, berm, and beach maintenance and monitoring activities are described in detail in the monitoring and maintenance plan (Attachment K). Inspections will be completed by EOS staff or designated personnel. Inspections will generally consist of visual observation and documentation and photo-documentation. Bank and berm inspections will be conducted annually, after flood events, and after seismic events that approach or exceed the seismic design criteria. These inspections will visually assess the condition of the bank rock armor and the berm substrate above the rock armor.

Beach inspections will be completed to assess the condition of imported beach fill material in areas where monitoring stake markers are embedded in imported beach material at a depth of

1 ft above the final excavated surface of the beach. Beach inspections will be conducted semiannually for the first 2 years following construction, and annually in post-construction years 3 through 5. Monitoring stakes were installed to monitor the magnitude of any erosion in three areas of the beach where substrate with total PCBs concentrations greater than 100 µg/kg was left at a depth of 3 ft below ground surface. If areas of scour are observed during inspections, they will be recorded and photographed. In the unlikely event that scour exposes native fill material underneath the imported beach fill, EOS will notify DEQ and coordinate backfilling of these exposed areas during a subsequent in-water work window.

All bank, berm, and beach inspection reports will be submitted to DEQ annually with vegetation inspection reports, as described below.

5.1.2 Vegetation Survival and Growth

Monitoring and maintenance of all beach and riparian zone vegetation planted as part of the Riverbank SCM will be conducted during a 10-year post-construction monitoring program. This monitoring program includes performance standards for plant density, percent survival, non-native cover, and plant diversity. Additional details are provided in the long-term monitoring and maintenance plan (Attachment K).

As needed during the monitoring period, plants will be replaced in-kind, or with an approved substitution as required to meet the percent survival and density requirements of the long-term monitoring and maintenance plan.

Yearly monitoring reports will be submitted to the USACE and DEQ by December 31 of each monitoring year. A description of the monitoring report contents is included in the long-term monitoring and maintenance plan.

5.2 INSTITUTIONAL CONTROLS

Institutional controls will be maintained under the EES filed for the property and will include the following requirements:

- Planted portions of the project area will be maintained as habitat
- The rock armor will be maintained as a cap over the slag-soil fill
- DEQ will be contacted prior to any modification of the rock armor.

6 REFERENCES

AECOM. 2011. Revised EOS Additional Riverbank and Upper Beach Soil Sampling Report. Prepared for Evraz Oregon Steel Mills Inc. AECOM. August 17.

AECOM and Integral. 2013. Revised Basis of Design/Conceptual Design for Upper Beach and Riverbank Interim Action, Evraz Oregon Steel, Portland, Oregon. AECOM and Integral Consulting Inc. May 24.

AECOM and Integral. 2014. Upland human health risk assessment for the EVRAZ Oregon Steel Facility, Portland Oregon. AECOM and Integral Consulting Inc. April.

DEQ. 2000. Voluntary Agreement for Remedial Investigation and Source Control Measures between Oregon Steel Mills Inc. and Oregon Department of Environmental Quality. DEQ No. WPMVC-NWR-00-10.

DEQ. 2014. Record of Decision, Selected Source Control Measure for the EVRAZ Oregon Steel Mills Riverbank Portland, Oregon. State of Oregon Department of Environmental Quality. November.

DEQ and USEPA. 2005. Portland Harbor Joint Source Control Strategy. State of Oregon Department of Environmental Quality and U.S. Environmental Protection Agency. September 1.

Integral and CRETE. 2015. Design report, riverbank source control measure, EVRAZ Oregon Steel. Integral Consulting Inc., Portland, OR, and CRETE Consulting, Inc., Seattle, WA. February.

Integral. 2014. Revised Work Plan for Berm, Upper Beach, North Alcove and Bank Face Soil Sampling, EVRAZ Oregon Steel, Portland, Oregon. Integral Consulting Inc., Portland, OR. November 3.

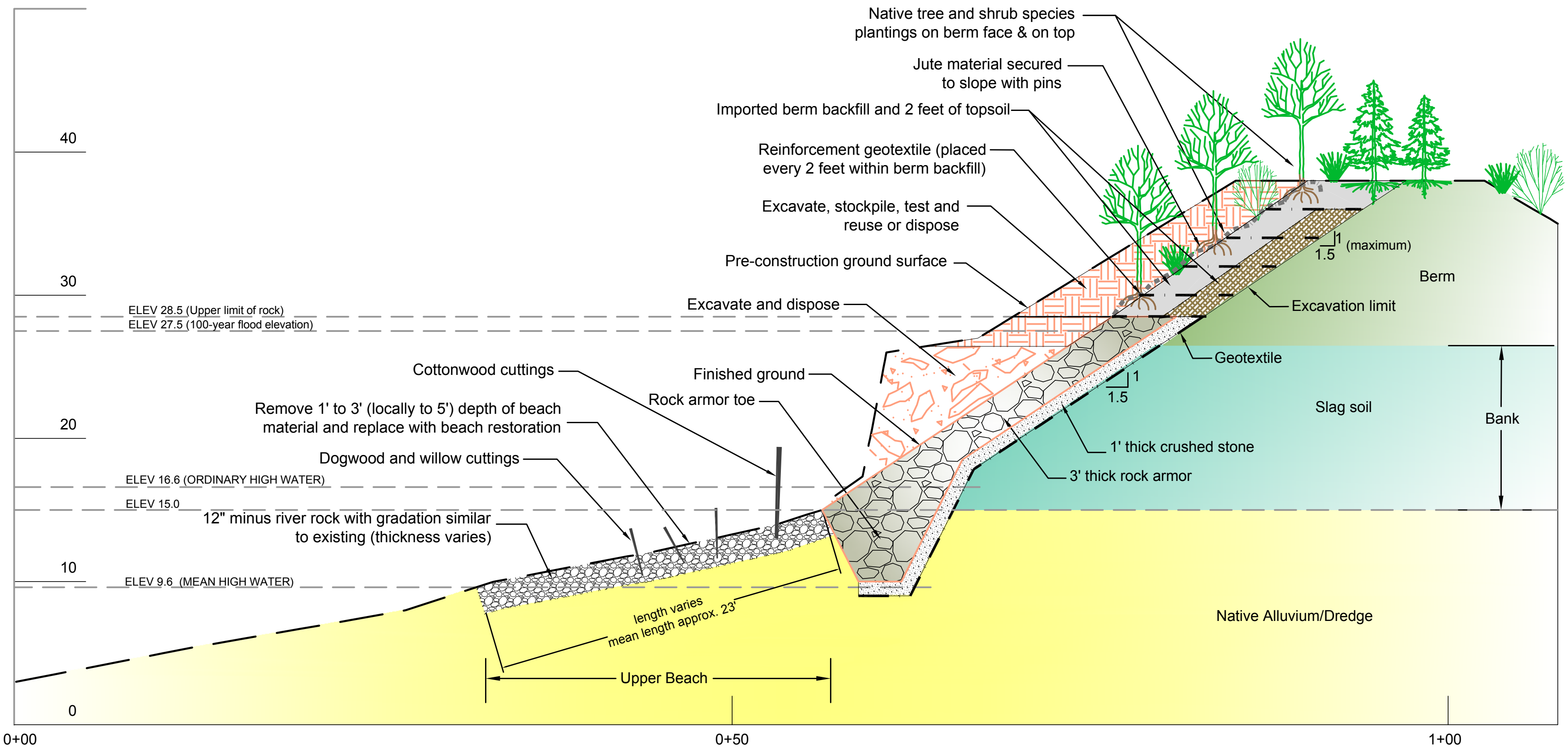
Integral. 2015. Data report for berm, upper beach, and north alcove sampling, EVRAZ Oregon Steel. Integral Consulting Inc., Portland, OR. January.

RETEC. 2006. Riverbank Source Control Evaluation Report. Prepared for Oregon Steel Mills Inc. The RETEC Group, Inc. May 17.

FIGURES

integral consulting inc.

Figure 1.
Topographic/Location Map
EVRAZ Oregon Steel
Portland, OR



NOTES:

1. VERTICAL DATUM IS NGVD29 (FEET)
2. DEQ ESTABLISHED A REFERENCE ELEVATION FOR MHW OF 9.6ft NGVD 29 (8ft COLUMBIA RIVER DATUM).

0 6 12
Feet
No Vertical Exaggeration

integral consulting inc.

Adapted from Revised Basis of Design/Conceptual Design for Upper Beach and Riverbank Interim Action, Evraz Oregon Steel, Portland, OR. AECOM and Integral, 2013

Figure 2.
Riverbank Design
EVRAZ Oregon Steel
Portland, OR

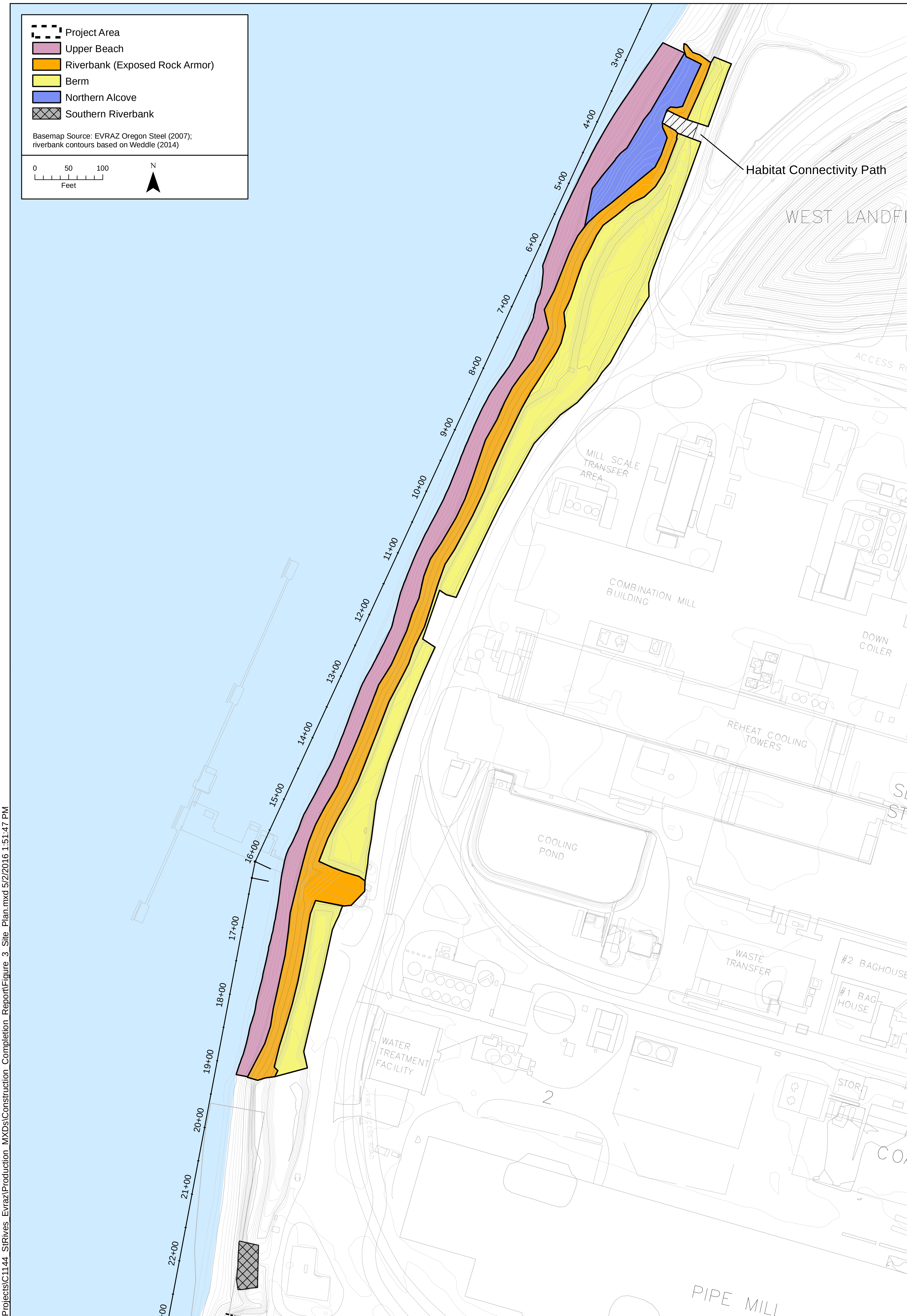
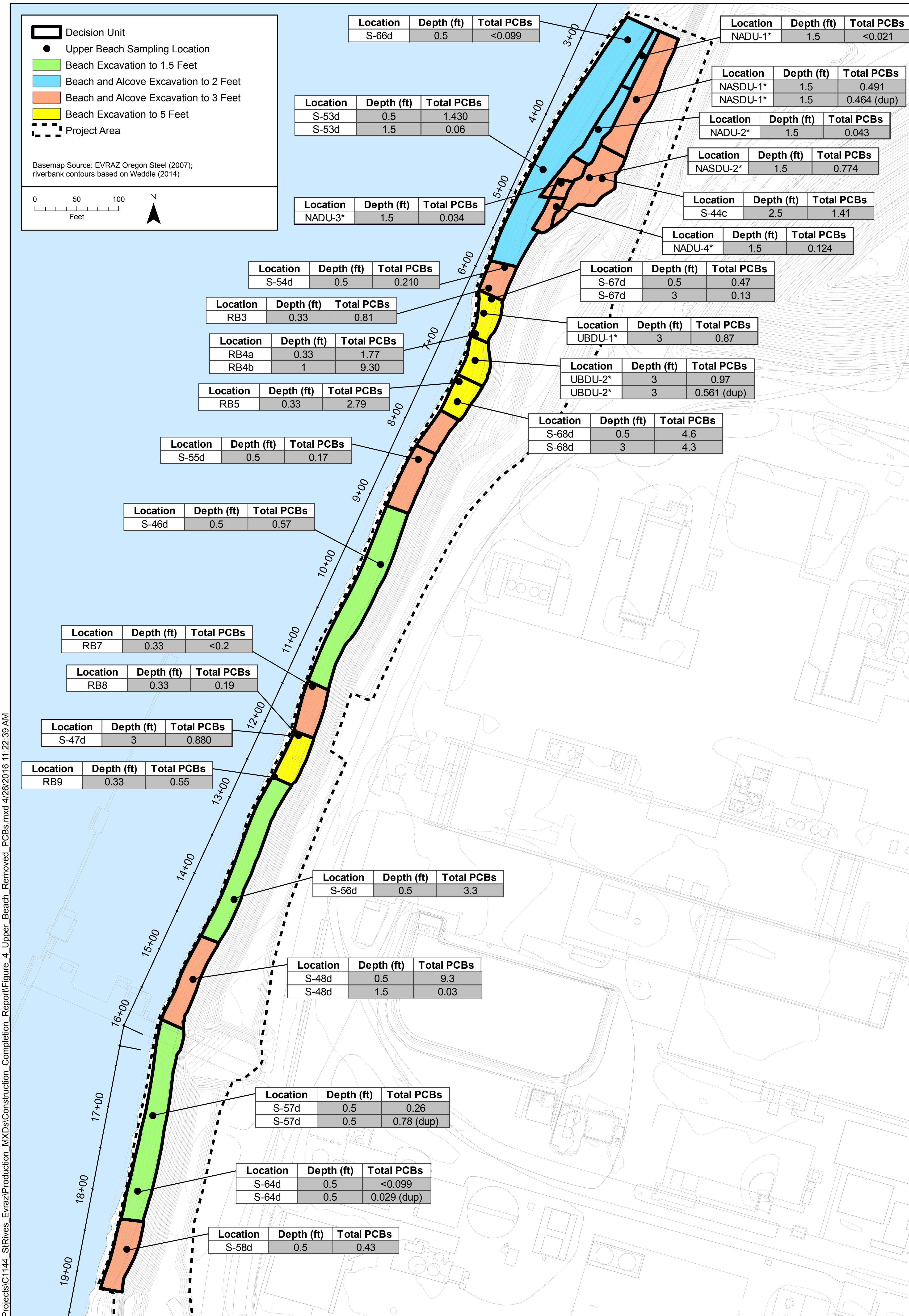


Figure 3.
Site Plan
EVRAZ Oregon Steel
Portland, OR

integral consulting inc.

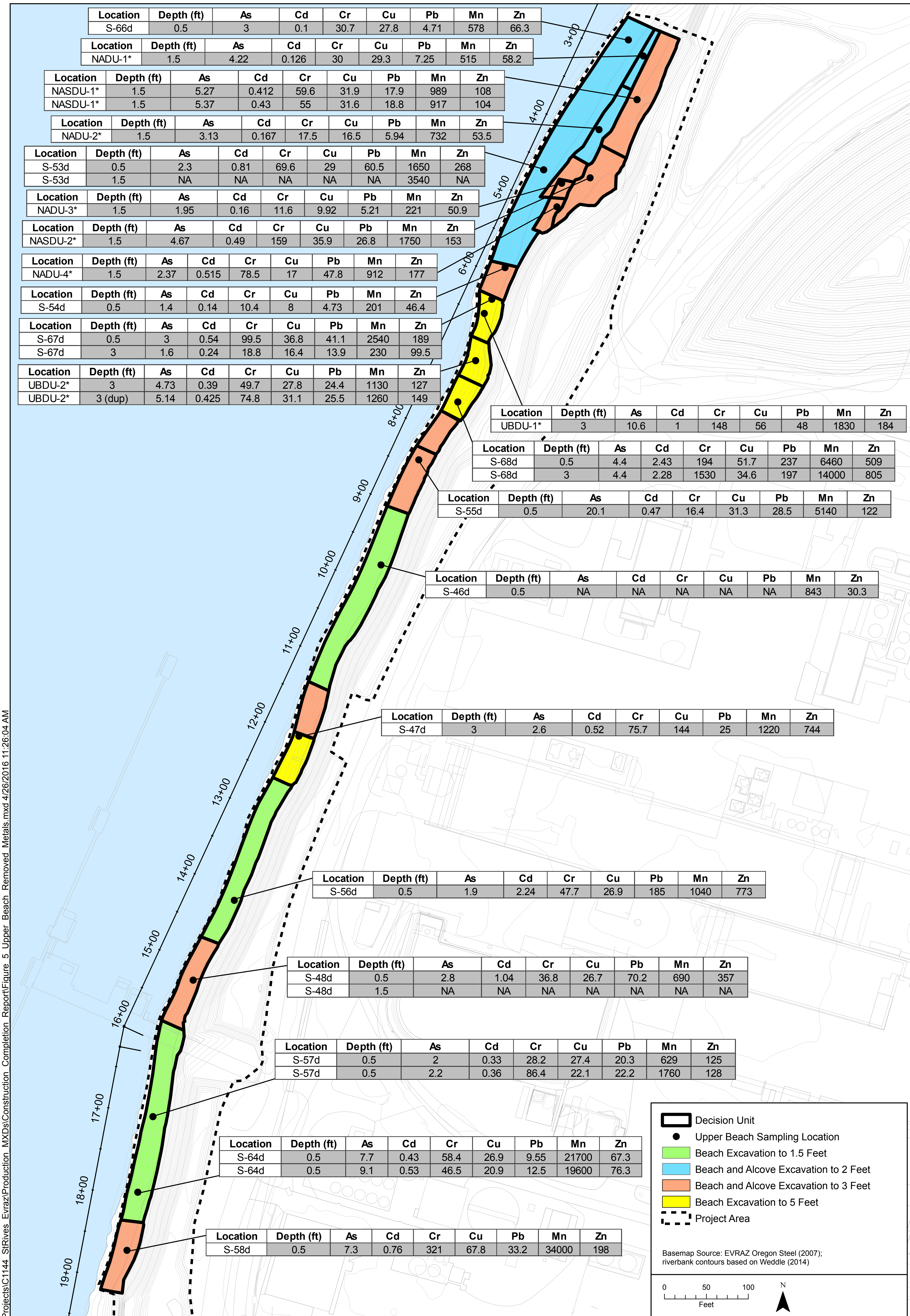
P:\Projects\C1144_StRives_Evraz\Production_MXDs\Construction_Completion_Report\Figure_3_Site_Plan.mxd 5/2/2016 1:51:47 PM



integral consulting inc.

Notes:
1. Results shown in mg/kg
2. * Denotes composite sample
NADU-1 through -4 and UBDU-1 through -2 are each composites of 3 sampling locations;
NASDU-1 and NASDU-2 are each composites of 4 sampling locations
3. Gray shading indicates removed sample

Figure 4.
Upper Beach Sample Locations Removed by Excavation (Total PCBs)
EVRAZ Oregon Steel
Portland, OR



Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
S-66d	0.5	3	0.1	30.7	27.8	4.71	578	66.3

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
NADU-1*	1.5	4.22	0.126	30	29.3	7.25	515	58.2

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
NASDU-1*	1.5	5.27	0.412	59.6	31.9	17.9	989	108
NASDU-1*	1.5	5.37	0.43	55	31.6	18.8	917	104

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
NADU-2*	1.5	3.13	0.167	17.5	16.5	5.94	732	53.5

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
S-53d	0.5	2.3	0.81	69.6	29	60.5	1650	268
S-53d	1.5	NA	NA	NA	NA	NA	3540	NA

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
NADU-3*	1.5	1.95	0.16	11.6	9.92	5.21	221	50.9

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
NASDU-2*	1.5	4.67	0.49	159	35.9	26.8	1750	153

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
NADU-4*	1.5	2.37	0.515	78.5	17	47.8	912	177

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
S-54d	0.5	1.4	0.14	10.4	8	4.73	201	46.4

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
S-67d	0.5	3	0.54	99.5	36.8	41.1	2540	189
S-67d	3	1.6	0.24	18.8	16.4	13.9	230	99.5

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
UBDU-2*	3	4.73	0.39	49.7	27.8	24.4	1130	127
UBDU-2*	3 (dup)	5.14	0.425	74.8	31.1	25.5	1260	149

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
UBDU-1*	3	10.6	1	148	56	48	1830	184

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
S-68d	0.5	4.4	2.43	194	51.7	237	6460	509
S-68d	3	4.4	2.28	1530	34.6	197	14000	805

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
S-55d	0.5	20.1	0.47	16.4	31.3	28.5	5140	122

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
S-46d	0.5	NA	NA	NA	NA	NA	843	30.3

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
S-47d	3	2.6	0.52	75.7	144	25	1220	744

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
S-56d	0.5	1.9	2.24	47.7	26.9	185	1040	773

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
S-48d	0.5	2.8	1.04	36.8	26.7	70.2	690	357
S-48d	1.5	NA	NA	NA	NA	NA	NA	NA

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
S-57d	0.5	2	0.33	28.2	27.4	20.3	629	125
S-57d	0.5	2.2	0.36	86.4	22.1	22.2	1760	128

Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
S-64d	0.5	7.7	0.43	58.4	26.9	9.55	21700	67.3
S-64d	0.5	9.1	0.53	46.5	20.9	12.5	19600	76.3

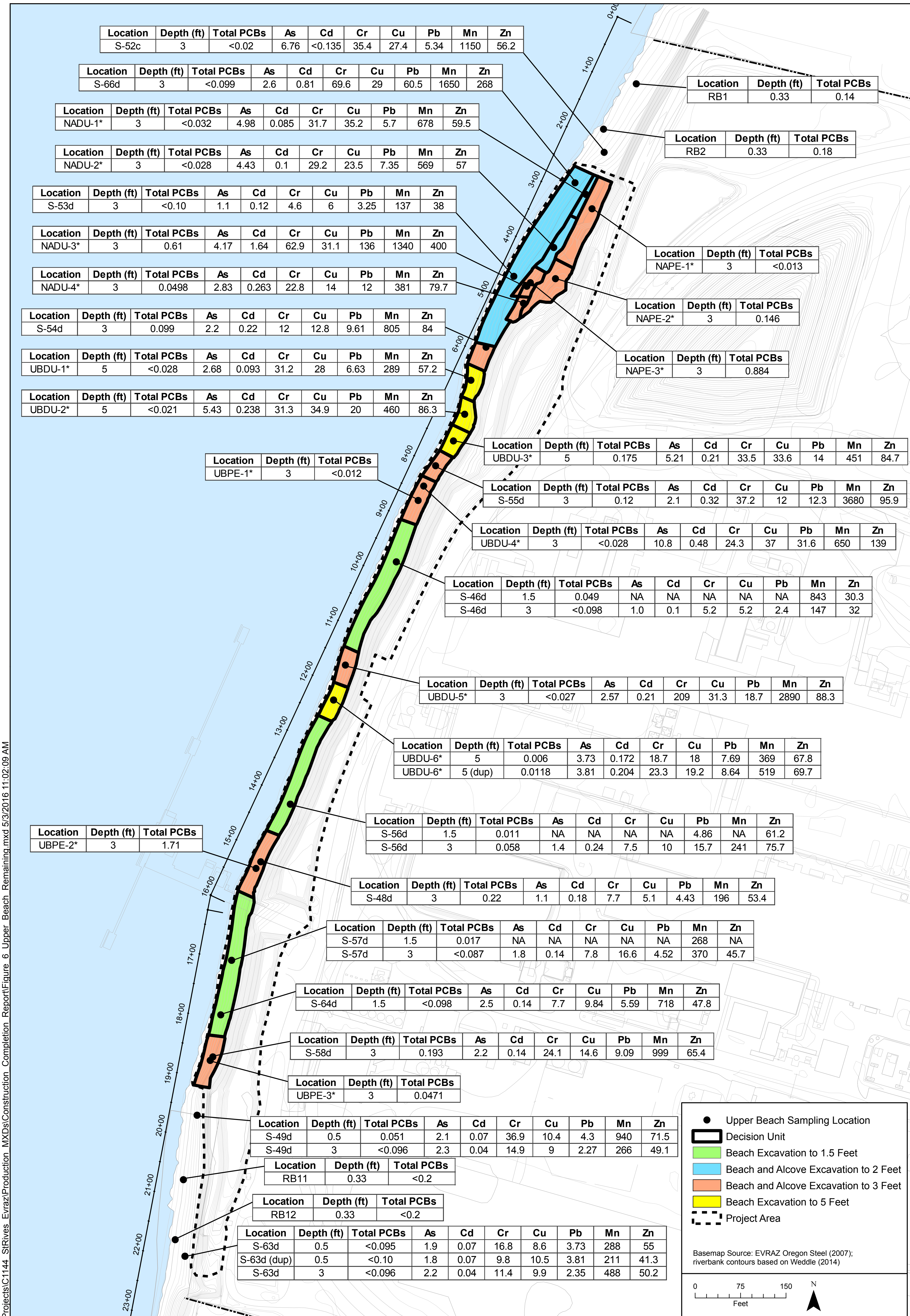
Location	Depth (ft)	As	Cd	Cr	Cu	Pb	Mn	Zn
S-58d	0.5	7.3	0.76	321	67.8	33.2	34000	198

P:\Projects\C1144 StRives Evraz\Production MXDs\Construction Completion Report\Figure 5 Upper Beach Removed Metals.mxd 4/26/2016 11:26:04 AM

integral consulting inc.

Notes:
1. Results shown in mg/kg
2. * Denotes composite sample
NADU-1 through -4 and UBDU-1 through -2 are each composites of 3 sampling locations;
NASDU-1 and NASDU-2 are each composites of 4 sampling locations
3. Gray shading indicates removed sample

Figure 5.
Upper Beach Sample Locations Removed by Excavation (Metals)
EVRAZ Oregon Steel
Portland, OR



Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
S-52c	3	<0.02	6.76	<0.135	35.4	27.4	5.34	1150	56.2
S-66d	3	<0.099	2.6	0.81	69.6	29	60.5	1650	268
NADU-1*	3	<0.032	4.98	0.085	31.7	35.2	5.7	678	59.5
NADU-2*	3	<0.028	4.43	0.1	29.2	23.5	7.35	569	57
S-53d	3	<0.10	1.1	0.12	4.6	6	3.25	137	38
NADU-3*	3	0.61	4.17	1.64	62.9	31.1	136	1340	400
NADU-4*	3	0.0498	2.83	0.263	22.8	14	12	381	79.7
S-54d	3	0.099	2.2	0.22	12	12.8	9.61	805	84
UBDU-1*	5	<0.028	2.68	0.093	31.2	28	6.63	289	57.2
UBDU-2*	5	<0.021	5.43	0.238	31.3	34.9	20	460	86.3
UBDU-3*	5	0.175	5.21	0.21	33.5	33.6	14	451	84.7
S-55d	3	0.12	2.1	0.32	37.2	12	12.3	3680	95.9
UBDU-4*	3	<0.028	10.8	0.48	24.3	37	31.6	650	139
S-46d	1.5	0.049	NA	NA	NA	NA	NA	843	30.3
S-46d	3	<0.098	1.0	0.1	5.2	5.2	2.4	147	32
UBDU-5*	3	<0.027	2.57	0.21	209	31.3	18.7	2890	88.3
UBDU-6*	5	0.006	3.73	0.172	18.7	18	7.69	369	67.8
UBDU-6*	5 (dup)	0.0118	3.81	0.204	23.3	19.2	8.64	519	69.7
S-56d	1.5	0.011	NA	NA	NA	NA	4.86	NA	61.2
S-56d	3	0.058	1.4	0.24	7.5	10	15.7	241	75.7
S-48d	3	0.22	1.1	0.18	7.7	5.1	4.43	196	53.4
S-57d	1.5	0.017	NA	NA	NA	NA	NA	268	NA
S-57d	3	<0.087	1.8	0.14	7.8	16.6	4.52	370	45.7
S-64d	1.5	<0.098	2.5	0.14	7.7	9.84	5.59	718	47.8
S-58d	3	0.193	2.2	0.14	24.1	14.6	9.09	999	65.4
S-49d	0.5	0.051	2.1	0.07	36.9	10.4	4.3	940	71.5
S-49d	3	<0.096	2.3	0.04	14.9	9	2.27	266	49.1
S-63d	0.5	<0.095	1.9	0.07	16.8	8.6	3.73	288	55
S-63d (dup)	0.5	<0.10	1.8	0.07	9.8	10.5	3.81	211	41.3
S-63d	3	<0.096	2.2	0.04	11.4	9.9	2.35	488	50.2

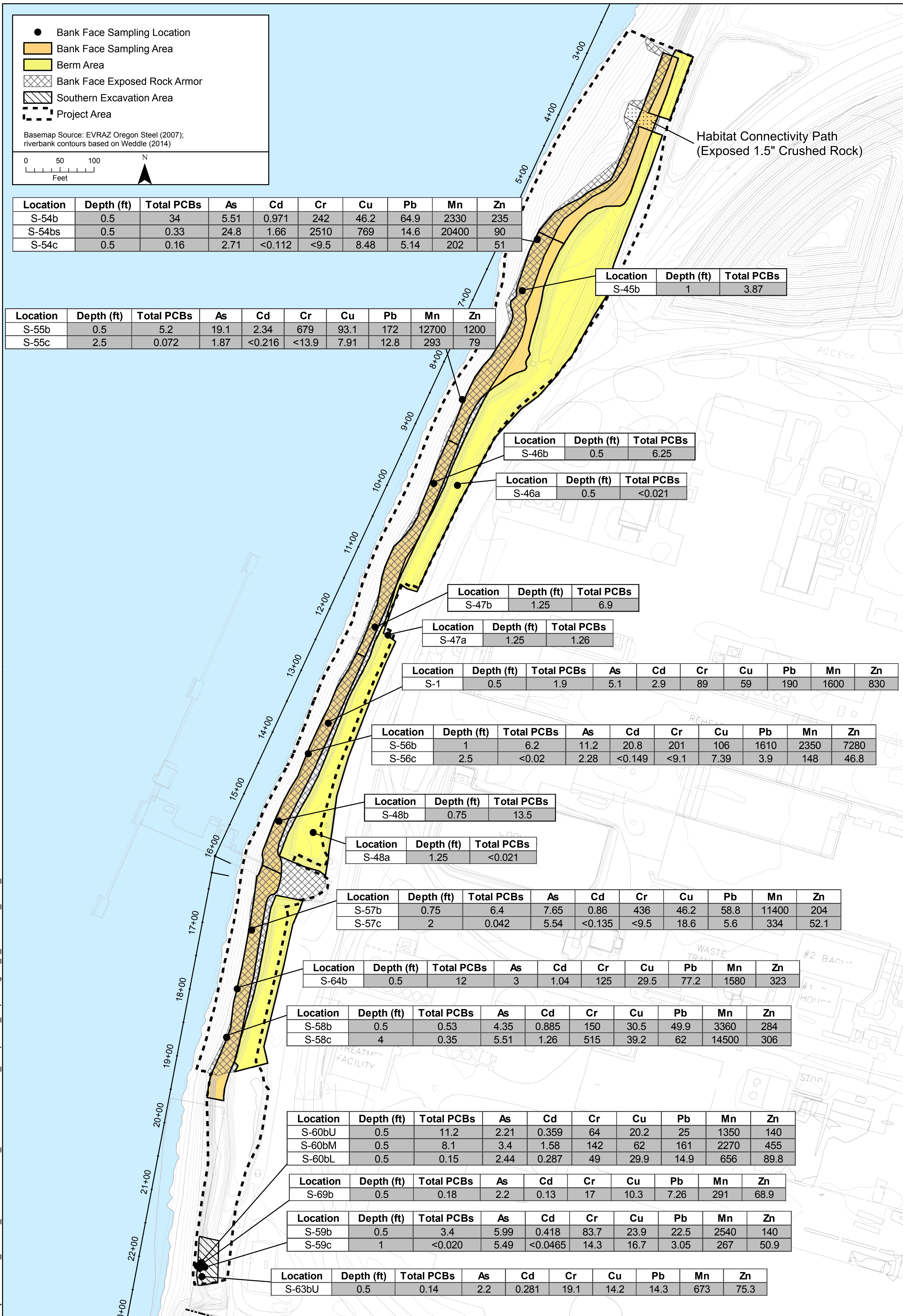
Location	Depth (ft)	Total PCBs
RB1	0.33	0.14
RB2	0.33	0.18
NAPE-1*	3	<0.013
NAPE-2*	3	0.146
NAPE-3*	3	0.884
UBPE-1*	3	<0.012
UBPE-2*	3	1.71
UBPE-3*	3	0.0471
RB11	0.33	<0.2
RB12	0.33	<0.2

P:\Projects\C1144 StRives Evraz\Production MXDs\Construction Completion Report\Figure 6 Upper Beach Remaining.mxd 5/3/2016 11:02:09 AM

integral consulting inc.

Notes:
1. Results shown in mg/kg
2. * Denotes composite sample
NADU-1 through -4 and UBDU-1 through -6 are each composites of 3 sampling locations

Figure 6.
Upper Beach Sample Locations Remaining Post-Excavation
EVRAZ Oregon Steel
Portland, OR



Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
S-54b	0.5	34	5.51	0.971	242	46.2	64.9	2330	235
S-54bs	0.5	0.33	24.8	1.66	2510	769	14.6	20400	90
S-54c	0.5	0.16	2.71	<0.112	<9.5	8.48	5.14	202	51

Location	Depth (ft)	Total PCBs
S-45b	1	3.87

Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
S-55b	0.5	5.2	19.1	2.34	679	93.1	172	12700	1200
S-55c	2.5	0.072	1.87	<0.216	<13.9	7.91	12.8	293	79

Location	Depth (ft)	Total PCBs
S-46b	0.5	6.25

Location	Depth (ft)	Total PCBs
S-46a	0.5	<0.021

Location	Depth (ft)	Total PCBs
S-47b	1.25	6.9

Location	Depth (ft)	Total PCBs
S-47a	1.25	1.26

Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
S-1	0.5	1.9	5.1	2.9	89	59	190	1600	830

Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
S-56b	1	6.2	11.2	20.8	201	106	1610	2350	7280
S-56c	2.5	<0.02	2.28	<0.149	<9.1	7.39	3.9	148	46.8

Location	Depth (ft)	Total PCBs
S-48b	0.75	13.5

Location	Depth (ft)	Total PCBs
S-48a	1.25	<0.021

Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
S-57b	0.75	6.4	7.65	0.86	436	46.2	58.8	11400	204
S-57c	2	0.042	5.54	<0.135	<9.5	18.6	5.6	334	52.1

Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
S-64b	0.5	12	3	1.04	125	29.5	77.2	1580	323

Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
S-58b	0.5	0.53	4.35	0.885	150	30.5	49.9	3360	284
S-58c	4	0.35	5.51	1.26	515	39.2	62	14500	306

Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
S-60bU	0.5	11.2	2.21	0.359	64	20.2	25	1350	140
S-60bM	0.5	8.1	3.4	1.58	142	62	161	2270	455
S-60bL	0.5	0.15	2.44	0.287	49	29.9	14.9	656	89.8

Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
S-69b	0.5	0.18	2.2	0.13	17	10.3	7.26	291	68.9

Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
S-59b	0.5	3.4	5.99	0.418	83.7	23.9	22.5	2540	140
S-59c	1	<0.020	5.49	<0.0465	14.3	16.7	3.05	267	50.9

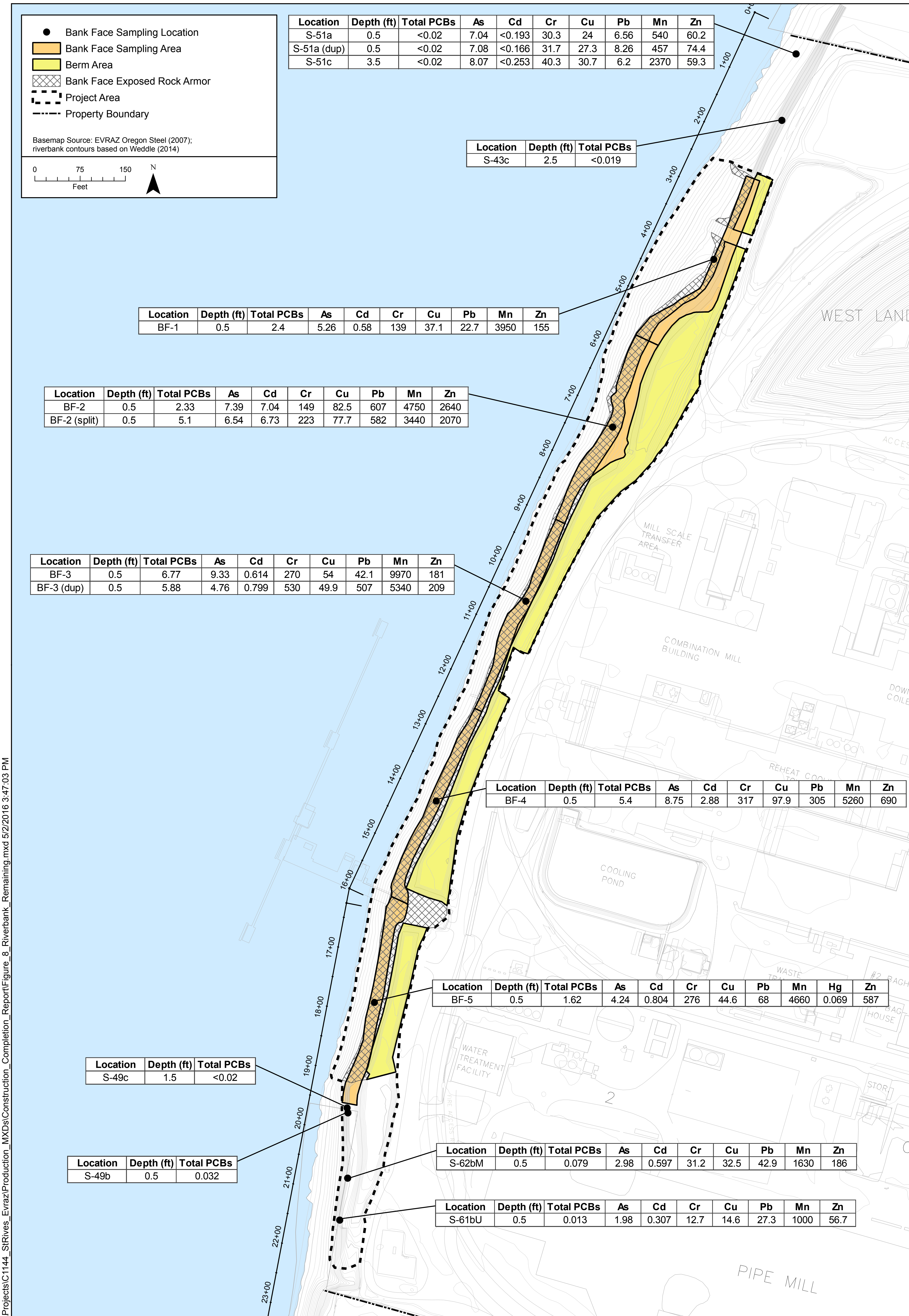
Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
S-63bU	0.5	0.14	2.2	0.281	19.1	14.2	14.3	673	75.3

P:\Projects\C1144_StRives_Evraz\Production_MXDs\Construction_Completion_Report\Figure_7_Riverbank_Berm_Removed.mxd 5/2/2016 4:12:27 PM

integral consulting inc.

Notes:
1. Results shown in mg/kg
2. Depths reference depth beneath pre-excavation bank face surface
3. b = Slag-soil fill bank face
4. c = Dredge fill, native alluvium or other fill below toe of riverbank
5. Gray shading indicates removed sample

Figure 7.
Bank and Berm Sample Locations Removed by Excavation
EVRAZ Oregon Steel
Portland, OR



Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
S-51a	0.5	<0.02	7.04	<0.193	30.3	24	6.56	540	60.2
S-51a (dup)	0.5	<0.02	7.08	<0.166	31.7	27.3	8.26	457	74.4
S-51c	3.5	<0.02	8.07	<0.253	40.3	30.7	6.2	2370	59.3

Location	Depth (ft)	Total PCBs
S-43c	2.5	<0.019

Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
BF-1	0.5	2.4	5.26	0.58	139	37.1	22.7	3950	155

Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
BF-2	0.5	2.33	7.39	7.04	149	82.5	607	4750	2640
BF-2 (split)	0.5	5.1	6.54	6.73	223	77.7	582	3440	2070

Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
BF-3	0.5	6.77	9.33	0.614	270	54	42.1	9970	181
BF-3 (dup)	0.5	5.88	4.76	0.799	530	49.9	507	5340	209

Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
BF-4	0.5	5.4	8.75	2.88	317	97.9	305	5260	690

Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Hg	Zn
BF-5	0.5	1.62	4.24	0.804	276	44.6	68	4660	0.069	587

Location	Depth (ft)	Total PCBs
S-49c	1.5	<0.02

Location	Depth (ft)	Total PCBs
S-49b	0.5	0.032

Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
S-62bM	0.5	0.079	2.98	0.597	31.2	32.5	42.9	1630	186

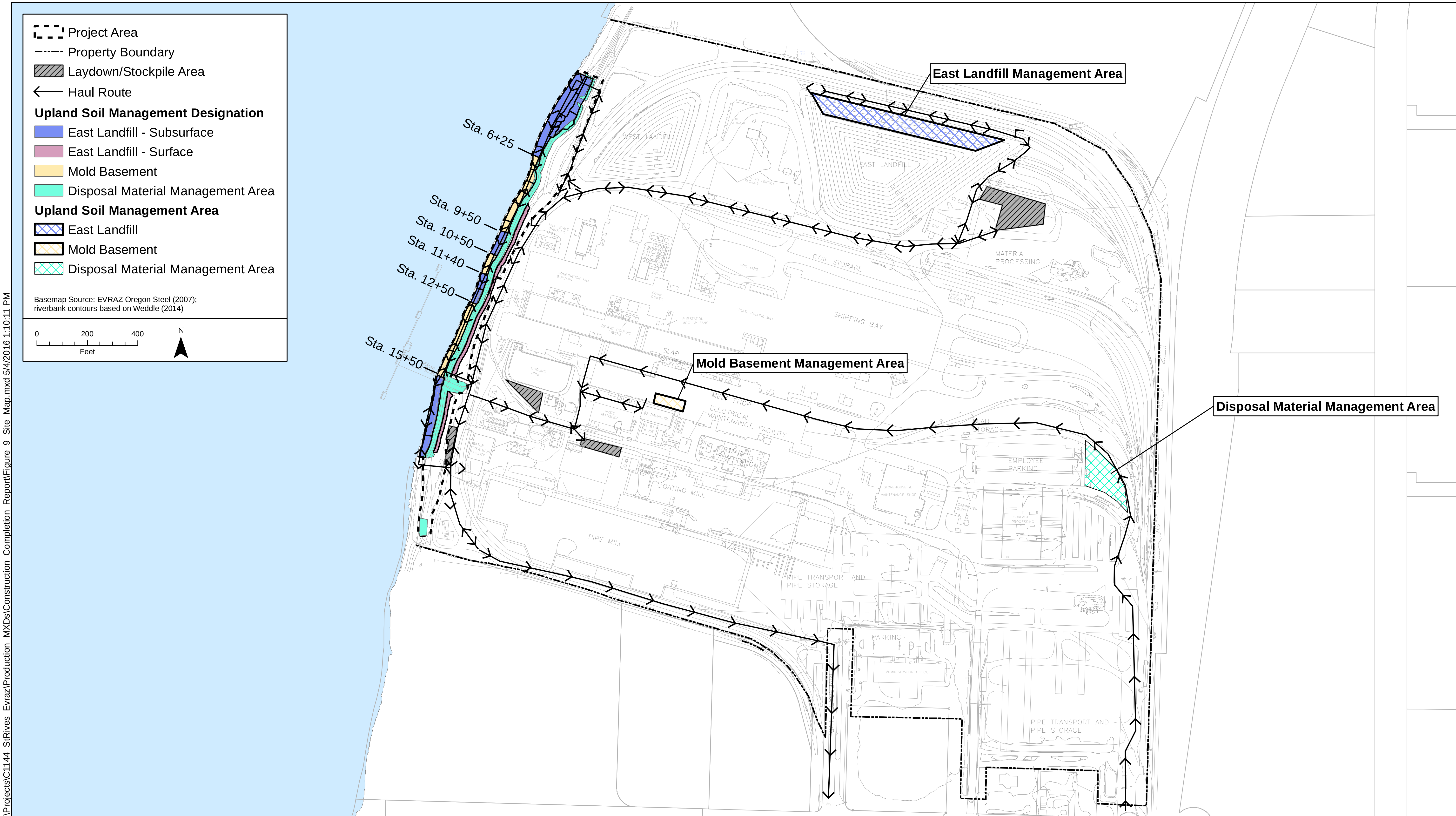
Location	Depth (ft)	Total PCBs	As	Cd	Cr	Cu	Pb	Mn	Zn
S-61bU	0.5	0.013	1.98	0.307	12.7	14.6	27.3	1000	56.7

P:\Projects\C1144_StRives_Evraz\Production_MXDs\Construction_Completion_Report\Figure_8_Riverbank_Remaining.mxd 5/2/2016 3:47:03 PM

integral consulting inc.

Notes:
1. Results shown in mg/kg
2. BF-1 through -5 are each composites of 10 sampling locations; Remaining concentrations at these locations are capped with geotextile fabric, 1 ft of crushed rock, and 3 ft of rock armor.

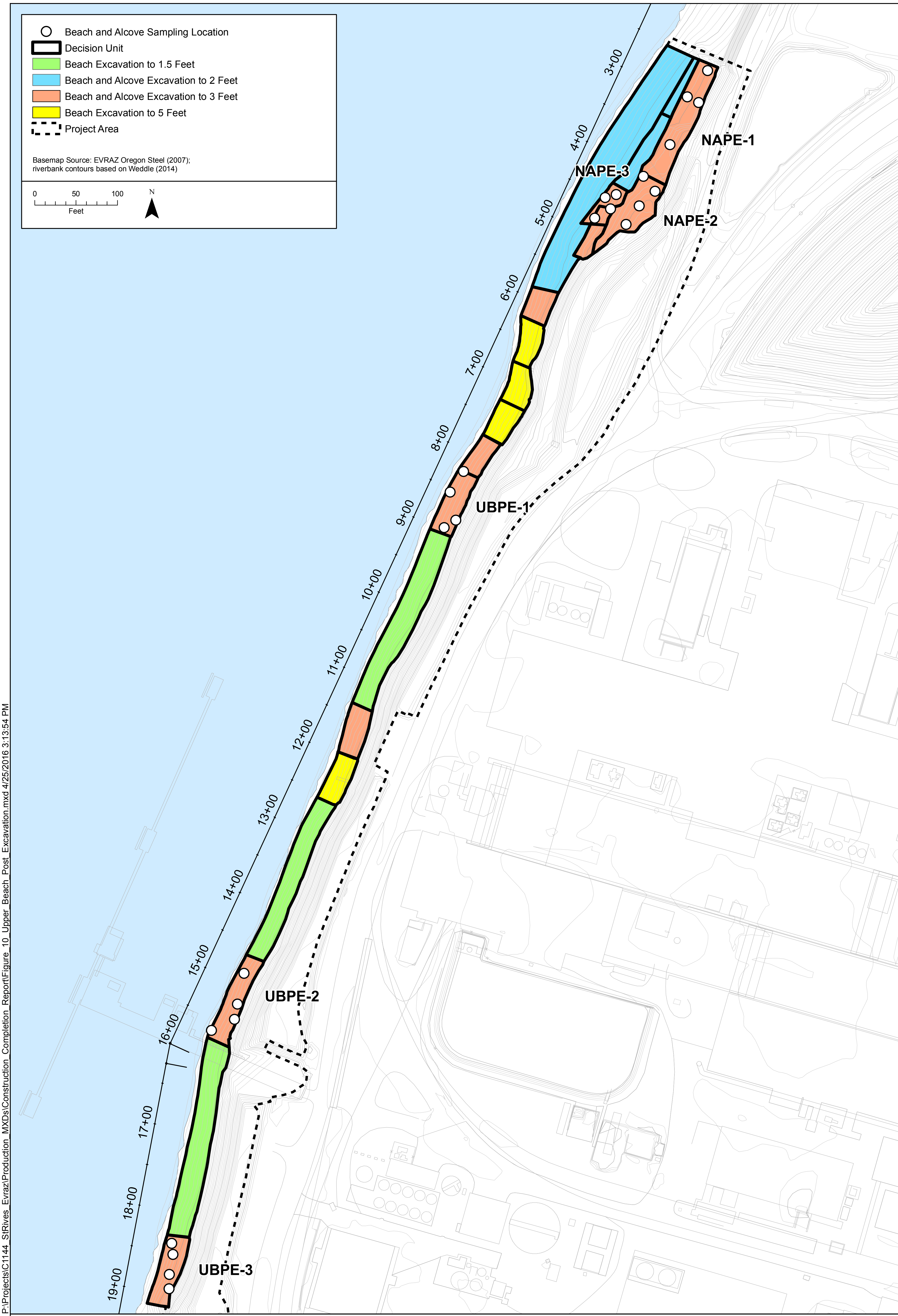
Figure 8.
Bank Face Sample Locations Remaining
EVRAZ Oregon Steel
Portland, OR



P:\Projects\C1144_StRives_Evraz\Production_MXDs\Construction_Completion_Report\Figure_9_Site_Map.mxd 5/4/2016 1:10:11 PM

integral consulting inc.

Figure 9.
Site Map
EVRAZ Oregon Steel
Portland, OR



P:\Projects\C1144_StRives_Evraz\Production_MXDs\Construction_Completion_Report\Figure_10_Upper_Beach_Post_Excavation.mxd 4/25/2016 3:13:54 PM

integral consulting inc.

Figure 10.
Upper Beach and North Alcove Post-Excavation
Sample Locations
EVRAZ Oregon Steel
Portland, OR

TABLES

Table 1. Beach and Berm Import Material Specifications

Material Type	Sieve Size /Number	Sieve Size (mm)	% Passing[a]
Beach Backfill	12"	305	95-100
	8"	203	70-80
	4"	102	45-55
	2"	51	30-40
	1"	25	20-30
	No. 4	4.8	10-15
Berm Backfill	4"	102	99-100
	2"	51	70-100
	No. 4	4.8	50-80
	No. 40	0.42	30 Max.
	No. 200	0.074	7.0 Max.
	Sand Equivalent	NA	50 Min.

Notes:

Material Specifications from Construction Drawings Sheet D-85803

NA = not applicable

[a] All percentages are by weight

Table 2. Topsoil Import Material Specifications

Material Type	Textural Class	% Total Weight	Average %	Other Requirements
Topsoil	Sand (0.05-2.0 mm dia.)	45-75	60	Meets ASTM D 5268. pH range of 5.5 to 7. Minimum 2% organic material content free of stones 1" or larger.
	Silt (0.002-0.05 mm dia.)	15-35	25	
	Clay (less than 0.002 mm dia.)	5-20	15	

Notes:

Material Specifications from Construction Drawings Sheet D-85815

Table 3. Import Material Analytical Results

				1 1/2" Crushed Rock						Berm Backfill[a]			Beach Backfill[b]								
	Import Criteria			LIVINGSTON G-121 ODOT 1½			LIVINGSTON G-121 ODOT 1½" E Comp/C Comp/W Comp			Owl Creek BF (7/23/15)			DAYBREAK G-109 BEACH BACK			DAYBREAK G-109 BEACH BACK Reanalysis			BB-S Comp		
				Grab			Composite			Composite			Grab			Grab			Composite		
Analyte	DEQ Background	MRL	Import Criteria	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL
Dioxins/Furans (pg/g)																					
1,2,3,4,6,7,8-Hepta CDD	—	2.5	2.5	0.144	0.111	1.00	—	—	—	0.852	0.101	5.00	0.300	0.0950	1.00	—	—	—	—	—	—
1,2,3,4,6,7,8-Hepta CDF	—	2.5	2.5	ND	0.106	1.00	—	—	—	0.445	0.102	5.00	ND	0.0760	1.00	—	—	—	—	—	—
1,2,3,4,7,8,9-Hepta CDF	—	2.5	2.5	ND	0.105	1.00	—	—	—	ND	0.102	5.00	ND	0.0757	1.00	—	—	—	—	—	—
1,2,3,4,7,8-Hexa CDD	—	2.5	2.5	ND	0.113	1.00	—	—	—	ND	0.107	5.00	ND	0.108	1.00	—	—	—	—	—	—
1,2,3,4,7,8-Hexa CDF	—	2.5	2.5	ND	0.0600	1.00	—	—	—	0.208	0.105	5.00	ND	0.0891	1.00	—	—	—	—	—	—
1,2,3,6,7,8-Hexa CDD	—	2.5	2.5	ND	0.118	1.00	—	—	—	ND	0.112	5.00	ND	0.113	1.00	—	—	—	—	—	—
1,2,3,6,7,8-Hexa CDF	—	2.5	2.5	ND	0.063	1.00	—	—	—	ND	0.109	5.00	ND	0.0929	1.00	—	—	—	—	—	—
1,2,3,7,8,9-Hexa CDD	—	2.5	2.5	ND	0.117	1.00	—	—	—	0.122	0.109	5.00	ND	0.113	1.00	—	—	—	—	—	—
1,2,3,7,8,9-Hexa CDF	—	2.5	2.5	ND	0.060	1.00	—	—	—	ND	0.104	5.00	ND	0.0898	1.00	—	—	—	—	—	—
1,2,3,7,8-Penta CDD	—	2.5	2.5	ND	0.117	1.00	—	—	—	ND	0.106	5.00	ND	0.0948	1.00	—	—	—	—	—	—
1,2,3,7,8-Penta CDF	—	2.5	2.5	ND	0.109	1.00	—	—	—	ND	0.110	5.00	ND	0.0948	1.00	—	—	—	—	—	—
2,3,4,6,7,8-Hexa CDF	—	2.5	2.5	ND	0.057	1.00	—	—	—	ND	0.0993	5.00	ND	0.0842	1.00	—	—	—	—	—	—
2,3,4,7,8-Penta CDF	—	2.5	2.5	ND	0.106	1.00	—	—	—	ND	0.107	5.00	ND	0.0923	1.00	—	—	—	—	—	—
2,3,7,8-Tetra CDD	—	0.5	0.5	ND	0.109	0.200	—	—	—	ND	0.102	0.999	ND	0.109	0.200	—	—	—	—	—	—
2,3,7,8-Tetra CDF	—	0.5	0.5	ND	0.078	0.200	—	—	—	0.128	0.101	0.999	ND	0.101	0.200	—	—	—	—	—	—
Octa CDD	—	5	5	0.746	0.171	2.00	—	—	—	5.3[c]	0.101	9.99	1.45	0.199	2.00	—	—	—	—	—	—
Octa CDF	—	5	5	ND	0.101	2.00	—	—	—	0.495	0.109	9.99	ND	0.200	2.00	—	—	—	—	—	—
Total Hepta CDD	—	—	—	0.291	0.111	1.00	—	—	—	1.97	0.100	5.00	0.564	0.0950	1.00	—	—	—	—	—	—
Total Hepta CDF	—	—	—	0.226	0.106	1.00	—	—	—	0.445	0.102	5.00	0.0901	0.0758	1.00	—	—	—	—	—	—
Total Hexa CDD	—	—	—	ND	0.117	1.00	—	—	—	0.651	0.109	5.00	0.128	0.112	1.00	—	—	—	—	—	—
Total Hexa CDF	—	—	—	ND	0.0598	1.00	—	—	—	0.355	0.104	5.00	ND	0.0889	1.00	—	—	—	—	—	—
Total Penta CDD	—	—	—	ND	0.117	1.00	—	—	—	ND	0.106	5.00	ND	0.0948	1.00	—	—	—	—	—	—
Total Penta CDF	—	—	—	ND	0.107	1.00	—	—	—	0.145	0.108	5.00	ND	0.0936	1.00	—	—	—	—	—	—
Total Tetra CDD	—	—	—	ND	0.109	0.200	—	—	—	ND	0.151	0.999	ND	0.109	0.200	—	—	—	—	—	—
Total Tetra CDF	—	—	—	ND	0.0779	0.200	—	—	—	0.128	0.101	0.999	ND	0.101	0.200	—	—	—	—	—	—
TOTAL TOXICITY EQUIVALENCY[d]																					
Mammalian TEF				0.33						0.36			0.32								
Fish TEF										0.39											
Bird TEF										0.54											
Polychlorinated Biphenyls (µg/kg)																					
Aroclor 1016				ND	—	10.3	—	—	—	ND	—	9.96	ND	—	10.2	—	—	—	—	—	—
Aroclor 1221				ND	—	10.3	—	—	—	ND	—	9.96	ND	—	10.2	—	—	—	—	—	—
Aroclor 1232				ND	—	10.3	—	—	—	ND	—	9.96	ND	—	10.2	—	—	—	—	—	—
Aroclor 1242				ND	—	10.3	—	—	—	ND	—	9.96	ND	—	10.2	—	—	—	—	—	—
Aroclor 1248				ND	—	10.3	—	—	—	ND	—	9.96	ND	—	10.2	—	—	—	—	—	—
Aroclor 1254				ND	—	10.3	—	—	—	ND	—	9.96	ND	—	10.2	—	—	—	—	—	—
Aroclor 1260				ND	—	10.3	—	—	—	ND	—	9.96	ND	—	10.2	—	—	—	—	—	—
Organochlorine Pesticides (µg/kg)																					
Aldrin				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
alpha-BHC				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
beta-BHC				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
delta-BHC				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
gamma-BHC (Lindane)				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
cis-Chlordane				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
trans-Chlordane				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
4,4'-DDD				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
4,4'-DDE				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
4,4'-DDT				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
Dieldrin				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
Endosulfan I				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
Endosulfan II				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—

Table 3. Import Material Analytical Results

				1 1/2" Crushed Rock						Berm Backfill[a]			Beach Backfill[b]								
	Import Criteria			LIVINGSTON G-121 ODOT 1½			LIVINGSTON G-121 ODOT 1½" E Comp/C Comp/W Comp			Owl Creek BF (7/23/15)			DAYBREAK G-109 BEACH BACK			DAYBREAK G-109 BEACH BACK Reanalysis			BB-S Comp		
				Grab			Composite			Composite			Grab			Grab			Composite		
Analyte	DEQ Background	MRL	Import Criteria	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL
Endosulfan sulfate				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
Endrin				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
Endrin Aldehyde				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
Endrin ketone				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
Heptachlor				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
Heptachlor epoxide				ND	—	4.82	—	—	—	ND	—	0.996	ND	—	4.42	—	—	—	—	—	—
Methoxychlor				ND	—	14.5	—	—	—	ND	—	2.99	ND	—	13.3	—	—	—	—	—	—
Chlordane (Technical)				ND	—	145	—	—	—	ND	—	29.9	ND	—	133	—	—	—	—	—	—
Toxaphene (Total)				ND	—	145	—	—	—	ND	—	29.9	ND	—	133	—	—	—	—	—	—
Semivolatile Organic Compounds (µg/kg)																					
Acenaphthene				ND	—	2.79	—	—	—	ND	—	9.97	ND	—	2.74	—	—	—	—	—	—
Acenaphthylene				ND	—	2.79	—	—	—	ND	—	9.97	ND	—	2.74	—	—	—	—	—	—
Anthracene				ND	—	2.79	—	—	—	ND	—	9.97	ND	—	2.74	—	—	—	—	—	—
Benz(a)anthracene				ND	—	2.79	—	—	—	ND	—	9.97	ND	—	2.74	—	—	—	—	—	—
Benzo(a)pyrene				ND	—	4.18	—	—	—	ND	—	14.9	ND	—	4.1	—	—	—	—	—	—
Benzo(b)fluoranthene				ND	—	4.18	—	—	—	ND	—	14.9	ND	—	4.1	—	—	—	—	—	—
Benzo(k)fluoranthene				ND	—	4.18	—	—	—	ND	—	14.9	ND	—	4.1	—	—	—	—	—	—
Benzo(g,h,i)perylene				ND	—	2.79	—	—	—	ND	—	9.97	ND	—	2.74	—	—	—	—	—	—
Chrysene				ND	—	2.79	—	—	—	ND	—	9.97	ND	—	2.74	—	—	—	—	—	—
Dibenz(a,h)anthracene				ND	—	2.79	—	—	—	ND	—	9.97	ND	—	2.74	—	—	—	—	—	—
Fluoranthene				ND	—	2.79	—	—	—	ND	—	9.97	ND	—	2.74	—	—	—	—	—	—
Fluorene				ND	—	2.79	—	—	—	ND	—	9.97	ND	—	2.74	—	—	—	—	—	—
Indeno(1,2,3-cd)pyrene				ND	—	2.79	—	—	—	ND	—	9.97	ND	—	2.74	—	—	—	—	—	—
1-Methylnaphthalene				ND	—	5.57	—	—	—	ND	—	19.9	ND	—	5.46	—	—	—	—	—	—
2-Methylnaphthalene				ND	—	5.57	—	—	—	ND	—	19.9	ND	—	5.46	—	—	—	—	—	—
Naphthalene				ND	—	5.57	—	—	—	ND	—	19.9	ND	—	5.46	—	—	—	—	—	—
Phenanthrene				ND	—	2.79	—	—	—	ND	—	9.97	ND	—	2.74	—	—	—	—	—	—
Pyrene				ND	—	2.79	—	—	—	ND	—	9.97	ND	—	2.74	—	—	—	—	—	—
Carbazole				ND	—	4.18	—	—	—	ND	—	14.9	ND	—	4.10	—	—	—	—	—	—
Dibenzofuran				ND	—	2.79	—	—	—	ND	—	9.97	ND	—	2.74	—	—	—	—	—	—
4-Chloro-3-methylphenol				ND	—	27.9	—	—	—	ND	—	99.7	ND	—	27.4	—	—	—	—	—	—
2-Chlorophenol				ND	—	13.9	—	—	—	ND	—	49.7	ND	—	13.6	—	—	—	—	—	—
2,4-Dichlorophenol				ND	—	13.9	—	—	—	ND	—	49.7	ND	—	13.6	—	—	—	—	—	—
2,4-Dimethylphenol				ND	—	13.9	—	—	—	ND	—	49.7	ND	—	13.6	—	—	—	—	—	—
2,4-Dinitrophenol				ND	—	69.7	—	—	—	ND	—	249	ND	—	68.3	—	—	—	—	—	—
4,6-Dinitro-2-methylphenol				ND	—	69.7	—	—	—	ND	—	249	ND	—	68.3	—	—	—	—	—	—
2-Methylphenol				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
3+4-Methylphenol(s)				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
2-Nitrophenol				ND	—	27.9	—	—	—	ND	—	99.7	ND	—	27.4	—	—	—	—	—	—
4-Nitrophenol				ND	—	27.9	—	—	—	ND	—	99.7	ND	—	27.4	—	—	—	—	—	—
Pentachlorophenol (PCP)				ND	—	5.57	—	—	—	ND	—	99.7	ND	—	27.4	—	—	—	—	—	—
Phenol				ND	—	5.57	—	—	—	ND	—	19.9	ND	—	5.46	—	—	—	—	—	—
2,3,4,6-Tetrachlorophenol				ND	—	13.9	—	—	—	ND	—	49.7	ND	—	13.6	—	—	—	—	—	—
2,3,5,6-Tetrachlorophenol				ND	—	14.6	—	—	—	ND	—	49.7	ND	—	14.3	—	—	—	—	—	—
2,4,5-Trichlorophenol				ND	—	13.9	—	—	—	ND	—	49.7	ND	—	13.6	—	—	—	—	—	—
2,4,6-Trichlorophenol				ND	—	13.9	—	—	—	ND	—	49.7	ND	—	13.6	—	—	—	—	—	—
Bis(2-ethylhexyl)phthalate				ND	—	41.8	—	—	—	ND	—	149	ND	—	41	—	—	—	—	—	—
Butyl benzyl phthalate				ND	—	27.9	—	—	—	ND	—	99.7	ND	—	27.4	—	—	—	—	—	—
Diethylphthalate				ND	—	27.9	—	—	—	ND	—	99.7	ND	—	27.4	—	—	—	—	—	—
Dimethylphthalate				ND	—	27.9	—	—	—	ND	—	99.7	ND	—	27.4	—	—	—	—	—	—
Di-n-butylphthalate				ND	—	27.9	—	—	—	ND	—	99.7	ND	—	27.4	—	—	—	—	—	—
Di-n-octyl phthalate				ND	—	27.9	—	—	—	ND	—	99.7	ND	—	27.4	—	—	—	—	—	—

Table 3. Import Material Analytical Results

				1 1/2" Crushed Rock						Berm Backfill[a]			Beach Backfill[b]								
	Import Criteria			LIVINGSTON G-121 ODOT 1½			LIVINGSTON G-121 ODOT 1½" E Comp/C Comp/W Comp			Owl Creek BF (7/23/15)			DAYBREAK G-109 BEACH BACK			DAYBREAK G-109 BEACH BACK Reanalysis			BB-S Comp		
				Grab			Composite			Composite			Grab			Grab			Composite		
Analyte	DEQ Background	MRL	Import Criteria	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL
N-Nitrosodimethylamine				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
N-Nitroso-di-n-propylamine				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
N-Nitrosodiphenylamine				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
Bis(2-Chloroethoxy) methane				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
Bis(2-Chloroethyl) ether				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
Bis(2-Chloroisopropyl) ether				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
Hexachlorobenzene				ND	—	2.79	—	—	—	ND	—	9.97	ND	—	2.74	—	—	—	—	—	—
Hexachlorobutadiene				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
Hexachlorocyclopentadiene				ND	—	13.9	—	—	—	ND	—	49.7	ND	—	13.6	—	—	—	—	—	—
Hexachloroethane				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
2-Chloronaphthalene				ND	—	2.79	—	—	—	ND	—	9.97	ND	—	2.74	—	—	—	—	—	—
1,2-Dichlorobenzene				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
1,3-Dichlorobenzene				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
1,4-Dichlorobenzene				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
1,2,4-Trichlorobenzene				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
4-Bromophenyl phenyl ether				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
4-Chlorophenyl phenyl ether				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
Aniline				ND	—	13.9	—	—	—	ND	—	49.7	ND	—	13.6	—	—	—	—	—	—
4-Chloroaniline				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
2-Nitroaniline				ND	—	55.7	—	—	—	ND	—	199	ND	—	54.6	—	—	—	—	—	—
3-Nitroaniline				ND	—	55.7	—	—	—	ND	—	199	ND	—	54.6	—	—	—	—	—	—
4-Nitroaniline				ND	—	55.7	—	—	—	ND	—	199	ND	—	54.6	—	—	—	—	—	—
Nitrobenzene				ND	—	27.9	—	—	—	ND	—	99.7	ND	—	27.4	—	—	—	—	—	—
2,4-Dinitrotoluene				ND	—	27.9	—	—	—	ND	—	99.7	ND	—	27.4	—	—	—	—	—	—
2,6-Dinitrotoluene				ND	—	27.9	—	—	—	ND	—	99.7	ND	—	27.4	—	—	—	—	—	—
Benzoic acid				ND	—	348	—	—	—	ND	—	1240	ND	—	341	—	—	—	—	—	—
Benzyl alcohol				ND	—	13.9	—	—	—	ND	—	49.7	ND	—	13.6	—	—	—	—	—	—
Isophorone				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
Azobenzene (1,2-DPH)				ND	—	6.97	—	—	—	ND	—	24.9	ND	—	6.83	—	—	—	—	—	—
Bis(2-Ethylhexyl) adipate				ND	—	69.7	—	—	—	ND	—	249	ND	—	68.3	—	—	—	—	—	—
3,3'-Dichlorobenzidine				ND	—	27.9	—	—	—	ND	—	99.7	ND	—	27.4	—	—	—	—	—	—
1,2-Dinitrobenzene				ND	—	69.7	—	—	—	ND	—	24.9	ND	—	68.3	—	—	—	—	—	—
1,3-Dinitrobenzene				ND	—	69.7	—	—	—	ND	—	24.9	ND	—	68.3	—	—	—	—	—	—
1,4-Dinitrobenzene				ND	—	69.7	—	—	—	ND	—	24.9	ND	—	68.3	—	—	—	—	—	—
Pyridine				ND	—	13.9	—	—	—	ND	—	49.7	ND	—	13.6	—	—	—	—	—	—

Table 3. Import Material Analytical Results

				1 1/2" Crushed Rock						Berm Backfill[a]			Beach Backfill[b]								
	Import Criteria			LIVINGSTON G-121 ODOT 1½			LIVINGSTON G-121 ODOT 1½" E Comp/C Comp/W Comp			Owl Creek BF (7/23/15)			DAYBREAK G-109 BEACH BACK			DAYBREAK G-109 BEACH BACK Reanalysis			BB-S Comp		
				Grab			Composite			Composite			Grab			Grab			Composite		
Analyte	DEQ Background	MRL	Import Criteria	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL
Total Metals (mg/kg)																					
Arsenic				1.02	—	1.02	—	—	—	ND	—	1.03	59.0[e]	—	1.02	4.45[e]	—	1.00	4.29	—	1.02
Barium				41.8	—	1.02	—	—	—	—	—	—	74.4	—	1.02	68.2	—	1.00	—	—	—
Cadmium				0.234	—	0.203	—	—	—	ND	—	0.206	ND	—	0.205	ND	—	0.995	—	—	—
Chromium				ND	—	4.06	—	—	—	3.88	—	1.03	9.69	—	4.09	9.51	—	0.995	—	—	—
Copper				98.2[c]	—	1.02	100/115/90.4[c]	—	1.11/1.09/1.10	11.7	—	1.03	—	—	—	—	—	—	—	—	—
Lead				2.42	—	0.203	—	—	—	ND	—	1.03	3.47	—	0.205	3.28	—	0.995	—	—	—
Manganese				204	—	1.02	—	—	—	145	—	1.03	—	—	—	—	—	—	—	—	—
Mercury				ND	—	0.0813	—	—	—	ND	—	0.165	ND	—	0.0818	ND	—	0.0796	—	—	—
Selenium				ND	—	2.03	—	—	—	—	—	—	ND	—	2.05	ND	—	1.99	—	—	—
Silver				ND	—	0.203	—	—	—	—	—	—	ND	—	0.205	ND	—	0.995	—	—	—
Zinc				30.0	—	4.06	—	—	—	17.1	—	4.11	—	—	—	—	—	—	—	—	—

Table 3. Import Material Analytical Results

	Beach Backfill[b]									Topsoil						
	BB-C Comp			BB-N Comp			BB-Total Comp			SH-Composite (9/14/15)			S+H-PortMix-Tual (composite/8.6)			Import Criteria
	Composite			Composite			Composite			Composite			Composite			
Analyte	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	
Dioxins/Furans (pg/g)																
1,2,3,4,6,7,8-Hepta CDD	—	—	—	—	—	—	0.299	0.108	4.96	76.3[c]			111[c]	0.263	0.998	2.5
1,2,3,4,6,7,8-Hepta CDF	—	—	—	—	—	—	0.11	0.0962	4.96	6.77[c]			7.91[c]	0.115	0.998	2.5
1,2,3,4,7,8,9-Hepta CDF	—	—	—	—	—	—	ND	0.0968	4.96	ND	0.737		0.954	0.114	0.998	2.5
1,2,3,4,7,8-Hexa CDD	—	—	—	—	—	—	ND	0.102	4.96	0.597			0.436	0.135	0.998	2.5
1,2,3,4,7,8-Hexa CDF	—	—	—	—	—	—	ND	0.0999	4.96	0.927			0.990	0.113	0.998	2.5
1,2,3,6,7,8-Hexa CDD	—	—	—	—	—	—	ND	0.107	4.96	1.99			3.14[c]	0.147	0.998	2.5
1,2,3,6,7,8-Hexa CDF	—	—	—	—	—	—	ND	0.103	4.96	0.434			0.559	0.115	0.998	2.5
1,2,3,7,8,9-Hexa CDD	—	—	—	—	—	—	ND	0.104	4.96	1.28			2.01	0.139	0.998	2.5
1,2,3,7,8,9-Hexa CDF	—	—	—	—	—	—	ND	0.0993	4.96	ND	0.278		0.157	0.112	0.998	2.5
1,2,3,7,8-Penta CDD	—	—	—	—	—	—	ND	0.101	4.96	ND	0.228		ND	0.192	0.998	2.5
1,2,3,7,8-Penta CDF	—	—	—	—	—	—	ND	0.105	4.96	ND	0.233		ND	0.272	0.998	2.5
2,3,4,6,7,8-Hexa CDF	—	—	—	—	—	—	ND	0.0945	4.96	0.699			0. 298	0.108	0.998	2.5
2,3,4,7,8-Penta CDF	—	—	—	—	—	—	ND	0.103	4.96	ND	0.606		ND	0.185	0.998	2.5
2,3,7,8-Tetra CDD	—	—	—	—	—	—	ND	0.103	0.993	ND	0.171		ND	0.228	2.00	0.5
2,3,7,8-Tetra CDF	—	—	—	—	—	—	ND	0.107	0.993	ND	0.294		ND	0.243	0.200	0.5
Octa CDD	—	—	—	—	—	—	1.81	0.107	9.93	857[c]			1,280[c]	0.296	0.998	5
Octa CDF	—	—	—	—	—	—	0.166	0.108	9.93	24.2[c]			28.3	0.113	2.00	5
Total Hepta CDD	—	—	—	—	—	—	0.523	0.108	4.96	156			243	0.263	0.998	—
Total Hepta CDF	—	—	—	—	—	—	0.11	0.0965	4.96	22.5			27.7	0.115	0.998	—
Total Hexa CDD	—	—	—	—	—	—	ND	0.162	4.96	16.2			24.6	0.141	0.998	—
Total Hexa CDF	—	—	—	—	—	—	ND	0.0992	4.96	10.8			14.6	0.112	0.998	—
Total Penta CDD	—	—	—	—	—	—	ND	0.101	4.96	ND	0.228		0.736	0.192	0.998	—
Total Penta CDF	—	—	—	—	—	—	ND	0.104	4.96	2.81			1.57	0.134	0.998	—
Total Tetra CDD	—	—	—	—	—	—	ND	0.144	0.993	ND	0.171		0.285	0.228	0.200	—
Total Tetra CDF	—	—	—	—	—	—	ND	0.107	0.993	1.27			1.00	0.109	0.200	—
TOTAL TOXICITY EQUIVALENCY[d]																
Mammalian TEF							0.33			1.69			2.86			
Fish TEF										0.68			1.21			
Bird TEF										0.54			1.55			
Polychlorinated Biphenyls (µg/kg)																
Aroclor 1016	—	—	—	—	—	—	ND	—	9.19	ND	5.84	11.7	ND	5.78	11.6	10
Aroclor 1221	—	—	—	—	—	—	ND	—	9.19	ND	5.84	11.7	ND	5.78	11.6	10
Aroclor 1232	—	—	—	—	—	—	ND	—	9.19	ND	11.7	11.7	ND	5.78	11.6	10
Aroclor 1242	—	—	—	—	—	—	ND	—	9.19	ND	5.84	11.7	ND	5.78	11.6	10
Aroclor 1248	—	—	—	—	—	—	ND	—	9.19	ND	5.84	11.7	ND	5.78	11.6	10
Aroclor 1254	—	—	—	—	—	—	ND	—	9.19	ND	5.84	11.7	ND	5.78	11.6	10
Aroclor 1260	—	—	—	—	—	—	ND	—	9.19	ND	5.84	11.7	ND	5.78	11.6	10
Organochlorine Pesticides (µg/kg)																
Aldrin	—	—	—	—	—	—	ND	—	1.8	ND	1.10	2.19	ND	—	2.25	5
alpha-BHC	—	—	—	—	—	—	ND	—	1.8	ND	1.10	2.19	ND	—	2.25	5
beta-BHC	—	—	—	—	—	—	ND	—	1.8	ND	2.19	2.19	ND	—	2.25	5
delta-BHC	—	—	—	—	—	—	ND	—	1.8	ND	1.10	2.19	ND	—	2.25	5
gamma-BHC (Lindane)	—	—	—	—	—	—	ND	—	1.8	ND	1.10	2.19	ND	—	2.25	5
cis-Chlordane	—	—	—	—	—	—	ND	—	1.8	ND	2.63	2.63	ND	—	2.25	100
trans-Chlordane	—	—	—	—	—	—	ND	—	1.8	ND	1.10	2.19	ND	—	2.25	100
4,4'-DDD	—	—	—	—	—	—	ND	—	1.8	ND	4.61	4.61	ND	—	2.25	5
4,4'-DDE	—	—	—	—	—	—	ND	—	1.8	ND	2.19	2.19	ND	—	2.25	5
4,4'-DDT	—	—	—	—	—	—	ND	—	1.8	ND	1.10	2.19	ND	—	2.25	5
Dieldrin	—	—	—	—	—	—	ND	—	1.8	ND	1.10	2.19	ND	—	2.25	5
Endosulfan I	—	—	—	—	—	—	ND	—	1.8	ND	1.10	2.19	ND	—	2.25	5
Endosulfan II	—	—	—	—	—	—	ND	—	1.8	ND	2.19	2.19	ND	—	2.25	5

Table 3. Import Material Analytical Results

	Beach Backfill[b]									Topsoil						
	BB-C Comp			BB-N Comp			BB-Total Comp			SH-Composite (9/14/15)			S+H-PortMix-Tual (composite/8.6)			Import Criteria
	Composite			Composite			Composite			Composite			Composite			
Analyte	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	
Endosulfan sulfate	—	—	—	—	—	—	ND	—	1.8	ND	2.19	2.19	ND	—	2.25	5
Endrin	—	—	—	—	—	—	ND	—	1.8	ND	1.10	2.19	ND	—	2.25	5
Endrin Aldehyde	—	—	—	—	—	—	ND	—	1.8	ND	2.19	2.19	ND	—	2.25	5
Endrin ketone	—	—	—	—	—	—	ND	—	1.8	ND	2.19	2.19	ND	—	2.25	5
Heptachlor	—	—	—	—	—	—	ND	—	1.8	ND	1.10	2.19	ND	—	2.25	5
Heptachlor epoxide	—	—	—	—	—	—	ND	—	1.8	ND	1.10	2.19	ND	—	2.25	5
Methoxychlor	—	—	—	—	—	—	ND	—	5.41	ND	7.02	7.02	ND	—	6.74	5
Chlordane (Technical)	—	—	—	—	—	—	ND	—	54.1	ND	32.9	65.8	ND	—	67.4	—
Toxaphene (Total)	—	—	—	—	—	—	ND	—	54.1	ND	32.9	65.8	ND	—	67.4	250
Semivolatile Organic Compounds (µg/kg)																
Acenaphthene	—	—	—	—	—	—	ND	—	2.65	ND	16.7	33.5	ND	—	266	330
Acenaphthylene	—	—	—	—	—	—	ND	—	2.65	ND	16.7	33.5	ND	—	266	330
Anthracene	—	—	—	—	—	—	ND	—	2.65	ND	16.7	33.5	ND	—	266	330
Benz(a)anthracene	—	—	—	—	—	—	ND	—	2.65	19.5	16.7	33.5	ND	—	266	330
Benzo(a)pyrene	—	—	—	—	—	—	ND	—	3.97	ND	25.1	50.2	ND	—	266	330
Benzo(b)fluoranthene	—	—	—	—	—	—	ND	—	3.97	ND	25.1	50.2	ND	—	266	—
Benzo(k)fluoranthene	—	—	—	—	—	—	ND	—	3.97	ND	25.1	50.2	ND	—	266	—
Benzo(g,h,i)perylene	—	—	—	—	—	—	ND	—	2.65	ND	16.7	33.5	ND	—	266	330
Chrysene	—	—	—	—	—	—	ND	—	2.65	18.5	16.7	33.5	ND	—	266	330
Dibenz(a,h)anthracene	—	—	—	—	—	—	ND	—	2.65	ND	16.7	33.5	ND	—	266	330
Fluoranthene	—	—	—	—	—	—	ND	—	2.65	56.3	16.7	33.5	ND	—	266	330
Fluorene	—	—	—	—	—	—	ND	—	2.65	ND	16.7	33.5	ND	—	266	330
Indeno(1,2,3-cd)pyrene	—	—	—	—	—	—	ND	—	2.65	ND	16.7	33.5	ND	—	266	330
1-Methylnaphthalene	—	—	—	—	—	—	ND	—	5.29	ND	33.5	66.8	ND	—	266	10000
2-Methylnaphthalene	—	—	—	—	—	—	ND	—	5.29	ND	33.5	66.8	ND	—	266	—
Naphthalene	—	—	—	—	—	—	ND	—	5.29	ND	33.5	66.8	ND	—	266	330
Phenanthrene	—	—	—	—	—	—	ND	—	2.65	46.0	16.7	33.5	ND	—	266	330
Pyrene	—	—	—	—	—	—	ND	—	2.65	45.4	16.7	33.5	ND	—	266	330
Carbazole	—	—	—	—	—	—	ND	—	3.97	ND	25.1	50.2	ND	—	266	—
Dibenzofuran	—	—	—	—	—	—	ND	—	2.65	ND	16.7	33.5	ND	—	266	330
4-Chloro-3-methylphenol	—	—	—	—	—	—	ND	—	26.5	ND	167	335	ND	—	266	—
2-Chlorophenol	—	—	—	—	—	—	ND	—	13.2	ND	83.6	167	ND	—	266	—
2,4-Dichlorophenol	—	—	—	—	—	—	ND	—	13.2	ND	83.6	167	ND	—	266	—
2,4-Dimethylphenol	—	—	—	—	—	—	ND	—	13.2	ND	83.6	167	ND	—	266	330
2,4-Dinitrophenol	—	—	—	—	—	—	ND	—	66.2	ND	418	836	ND	—	266	—
4,6-Dinitro-2-methylphenol	—	—	—	—	—	—	ND	—	66.2	ND	418	836	ND	—	638	—
2-Methylphenol	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	330
3+4-Methylphenol(s)	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	330
2-Nitrophenol	—	—	—	—	—	—	ND	—	26.5	ND	167	335	ND	—	266	—
4-Nitrophenol	—	—	—	—	—	—	ND	—	26.5	ND	167	335	ND	—	266	2000
Pentachlorophenol (PCP)	—	—	—	—	—	—	ND	—	26.5	ND	167	335	ND	—	266	—
Phenol	—	—	—	—	—	—	ND	—	5.29	ND	33.5	66.8	ND	—	266	330
2,3,4,6-Tetrachlorophenol	—	—	—	—	—	—	ND	—	13.2	ND	83.6	167	ND	—	266	—
2,3,5,6-Tetrachlorophenol	—	—	—	—	—	—	ND	—	13.2	ND	83.6	167	ND	—	266	—
2,4,5-Trichlorophenol	—	—	—	—	—	—	ND	—	13.2	ND	83.6	167	ND	—	266	—
2,4,6-Trichlorophenol	—	—	—	—	—	—	ND	—	13.2	ND	83.6	167	ND	—	266	—
Bis(2-ethylhexyl)phthalate	—	—	—	—	—	—	ND	—	39.7	ND	251	502	ND	—	266	330
Butyl benzyl phthalate	—	—	—	—	—	—	ND	—	26.5	212	167	335	ND	—	266	330
Diethylphthalate	—	—	—	—	—	—	ND	—	26.5	ND	167	335	ND	—	266	330
Dimethylphthalate	—	—	—	—	—	—	ND	—	26.5	ND	167	335	ND	—	266	330
Di-n-butylphthalate	—	—	—	—	—	—	ND	—	26.5	ND	167	335	ND	—	266	330
Di-n-octyl phthalate	—	—	—	—	—	—	ND	—	26.5	ND	167	335	ND	—	266	330

Table 3. Import Material Analytical Results

	Beach Backfill[b]									Topsoil						
	BB-C Comp			BB-N Comp			BB-Total Comp			SH-Composite (9/14/15)			S+H-PortMix-Tual (composite/8.6)			Import Criteria
	Composite			Composite			Composite			Composite			Composite			
Analyte	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	
N-Nitrosodimethylamine	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	—
N-Nitroso-di-n-propylamine	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	—
N-Nitrosodiphenylamine	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	330
Bis(2-Chloroethoxy) methane	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	—
Bis(2-Chloroethyl) ether	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	—
Bis(2-Chloroisopropyl) ether	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	—
Hexachlorobenzene	—	—	—	—	—	—	ND	—	2.65	ND	16.7	33.5	ND	—	266	330
Hexachlorobutadiene	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	330
Hexachlorocyclopentadiene	—	—	—	—	—	—	ND	—	13.2	ND	83.6	167	ND	—	266	
Hexachloroethane	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	330
2-Chloronaphthalene	—	—	—	—	—	—	ND	—	2.65	ND	16.7	33.5	ND	—	266	—
1,2-Dichlorobenzene	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	330
1,3-Dichlorobenzene	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	330
1,4-Dichlorobenzene	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	330
1,2,4-Trichlorobenzene	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	330
4-Bromophenyl phenyl ether	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	—
4-Chlorophenyl phenyl ether	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	—
Aniline	—	—	—	—	—	—	ND	—	13.2	ND	83.6	167	ND	—	266	—
4-Chloroaniline	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	—
2-Nitroaniline	—	—	—	—	—	—	ND	—	52.9	ND	335	668	ND	—	266	—
3-Nitroaniline	—	—	—	—	—	—	ND	—	52.9	ND	335	668	ND	—	266	—
4-Nitroaniline	—	—	—	—	—	—	ND	—	52.9	ND	335	668	ND	—	266	—
Nitrobenzene	—	—	—	—	—	—	ND	—	26.5	ND	167	335	ND	—	266	—
2,4-Dinitrotoluene	—	—	—	—	—	—	ND	—	26.5	ND	167	335	ND	—	266	—
2,6-Dinitrotoluene	—	—	—	—	—	—	ND	—	26.5	ND	167	335	ND	—	266	—
Benzoic acid	—	—	—	—	—	—	ND	—	330	ND	2090	4180	ND	—	1330	2000
Benzyl alcohol	—	—	—	—	—	—	ND	—	13.2	ND	83.6	167	ND	—	266	330
Isophorone	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	—
Azobenzene (1,2-DPH)	—	—	—	—	—	—	ND	—	6.62	ND	41.8	83.6	ND	—	266	—
Bis(2-Ethylhexyl) adipate	—	—	—	—	—	—	ND	—	66.2	ND	418	836	ND	—	266	—
3,3'-Dichlorobenzidine	—	—	—	—	—	—	ND	—	26.5	ND	167	335	ND	—	266	—
1,2-Dinitrobenzene	—	—	—	—	—	—	ND	—	66.2	ND	418	836	ND	—	266	—
1,3-Dinitrobenzene	—	—	—	—	—	—	ND	—	66.2	ND	418	836	ND	—	266	—
1,4-Dinitrobenzene	—	—	—	—	—	—	ND	—	66.2	ND	418	836	ND	—	266	—
Pyridine	—	—	—	—	—	—	ND	—	13.2	ND	83.6	167	ND	—	531	—

Table 3. Import Material Analytical Results

	Beach Backfill[b]									Topsoil						
	BB-C Comp			BB-N Comp			BB-Total Comp			SH-Composite (9/14/15)			S+H-PortMix-Tual (composite/8.6)			Import Criteria
	Composite			Composite			Composite			Composite			Composite			
Analyte	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	RESULT	DL	RL	
Total Metals (mg/kg)																
Arsenic	4.43	—	1.04	4.46	—	1.10	3.91	—	1.10	3.78	0.612	1.22	ND	—	1.23	8.8
Barium	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cadmium	—	—	—	—	—	—	ND	—	0.220	0.257	0.612	0.245	ND	—	0.246	0.63
Chromium	—	—	—	—	—	—	8.59	—	1.10	18.9	0.612	1.22	8.65	—	1.23	76
Copper	—	—	—	—	—	—	25.2	—	2.20	25.8	0.612	1.22	19.1	—	4.91	34
Lead	—	—	—	—	—	—	3.36	—	0.220	9.92	0.612	0.245	4.68	—	2.46	79
Manganese	—	—	—	—	—	—	323	—	1.10	1180	0.612	1.22	265	—	2.46	1800
Mercury	—	—	—	—	—	—	ND	—	0.0881	ND	0.049	0.0979	ND	—	0.0983	0.23
Selenium	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Silver	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Zinc	—	—	—	—	—	—	28.9	—	4.40	72.1	2.45	4.90	35.3	—	4.91	180

Source information:

Livingston G-121 ODOT 1 1/2" (1 1/2" Crushed Rock) - Monolithic basalt from Livingston Mountain near Camas, WA

Owl Creek BF (Berm Backfill) - Blend of sand dredged from the Cowlitz River near Kelso, WA and aggregate from the Carroll Road Quarry in Kelso, WA

Daybreak G-109 Beach Back (Beach Backfill) - Excavated from the Daybreak gravel pit in the east fork of the Lewis River valley. Pit location is approx. 1,000 to 2,000 ft from the current riverbed.

SH Composite (Topsoil) - Four parts sandy loam from the Molalla River, one part compost from S & H Landscape Supply in North Portland, OR

S + H PortMix Tual (Topsoil) - City of Portland BES-approved topsoil mix for stormwater infiltration facilities; from S & H Landscape Supply in Tualatin, OR

Notes:

— = not analyzed
DL = detection limit
ND = not detected at or above the detection limit
RL = reporting limit
TEF = toxicity equivalence factor

[a] Aggregate for berm backfill consists of granular material meeting the following gradation requirements: ≥99% passing 4-in. sieve; 70-100% passing 2-in. sieve; 50-80% passing No. 4; 30% max. passing No. 40; 7% max. passing No. 200; 50% min. sand equivalent.

[b] All beach backfill results are from the same source. Beach backfill is naturally occurring water-rounded gravel material meeting the following gradation: >95% passing 12-in. sieve; 70-80% passing 8-in. sieve; 45-55% passing 4-in. sieve; 30-40% passing 2-in. sieve; 20-30% passing 1-in. sieve; 10-15% passing No. 4.

[c] Exceeds Import Criteria.

[d] Toxicity equivalent calculated using DLs for undetected congeners.

[e] Original sample result reported by laboratory was 59 mg/kg. The result from reanalysis of a second aliquot from the same sample was 4.45 mg/kg. Three 5-point composite samples were then collected from the material, and the resulting arsenic concentrations were 4.29, 4.43, and 4.46 mg/kg. Laboratory reports from these additional analyses have not yet been received.

Table 4. Post-excavation Bank and Upper Beach Sample Analytical Results

	Bank Face							Beach			Northern Alcove		
	BF-1	BF-2	BF-2-Split[a]	BF-3	BF-7[b]	BF-4	BF-5	UBPE-1	UBPE-2	UBPE-3	NAPE-1	NAPE-2	NAPE-3
Sample Date:	8/3/2015	8/5/2015	8/5/2015	8/17/2015	8/17/2015	8/20/2015	9/21/2015	8/25/2015	9/15/2015	9/16/2015	9/2/2015	9/1/2015	9/1/2015
Analyte													
Polychlorinated Biphenyls (mg/kg)													
Aroclor 1016	<0.027	<0.055	<0.035	<0.099	<0.099	<0.57	<0.027	<0.0058	<0.270	<0.0065	<0.0058	<0.0058	<0.054
Aroclor 1221	<0.054	<0.110	<0.070	<0.2	<0.2	<1.2	<0.053	<0.012	<0.530	<0.013	<0.013	<0.012	<0.110
Aroclor 1232	<0.027	<0.055	<0.035	<0.099	<0.099	<0.57	<0.027	<0.0058	<0.270	<0.0065	<0.0064	<0.0058	<0.054
Aroclor 1242	<0.027	<0.055	<0.035	<0.099	<0.099	<0.57	<0.027	<0.0058	<0.270	<0.0065	<0.0064	<0.0058	<0.054
Aroclor 1248	1.3	0.86	2.1	3.3	3.0	5.4	0.76	<0.0058	1.30	0.021	<0.0064	0.050	0.38
Aroclor 1254	1.1	0.94	1.9	3.0	2.5	<7.0	0.68	<0.0058	<0.270	0.019	<0.0064	0.075	0.44
Arolcor 1260	<0.140	0.53 J	1.10	0.47	0.38	<1.5	0.18	<0.0058	0.41	0.0071 J	<0.0064	0.021	0.064
Aroclor 1262	<0.068	<0.055	<0.035	<0.099	<0.099	<0.71	<0.027	<0.0058	<0.270	<0.0065	<0.0064	<0.0058	<0.054
Aroclor 1268	<0.038	<0.055	<0.035	<0.099	<0.099	<0.91	<0.027	<0.0058	<0.270	<0.0065	<0.0064	<0.0058	<0.054
Total PCB Aroclors (ND=0)	2.4	2.33	5.10	6.77	5.88	5.4	1.62	<0.012	1.71	0.0471	<0.013	0.146	0.884
Total Metals (mg/kg)													
Arsenic	5.26 J	7.39 J	6.54	9.33 J	4.76 J	8.75 J	4.24	—	—	—	—	—	—
Barium	—	—	—	—	—	—	—	—	—	—	—	—	—
Cadmium	0.58 J	7.04 J	6.73	0.614	0.799	2.88	0.804	—	—	—	—	—	—
Chromium	139 J	149 J	223 J	270	530	317 J	276	—	—	—	—	—	—
Copper	37.1 J	82.5 J	77.7	54 J	49.9 J	97.9	44.6	—	—	—	—	—	—
Lead	22.7	607	582	42.1	50.7	305	68	—	—	—	—	—	—
Manganese	3,950 J	4,750 J	3440 J	9,970 J	5,340 J	5,260 J	4,660	—	—	—	—	—	—
Mercury	—	—	—	—	—	—	0.069	—	—	—	—	—	—
Selenium	—	—	—	—	—	—	—	—	—	—	—	—	—
Silver	—	—	—	—	—	—	—	—	—	—	—	—	—
Zinc	155	2,640	2,070 J	181	209	690	587	—	—	—	—	—	—

Notes:

— = Not analyzed
BF = bank face
NAPE = north alcove post excavation
ND = non-detect
PCB = polychlorinated biphenyl
UBPE = upper beach post-excavation

J = The associated numerical value is an estimated quantity.

[a] Split sample of BF-2. Laboratory processed this sample using incremental sampling procedures.

[b] Duplicate sample of BF-3.